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LONDON, SATURDAY, SEPTEMBER 14, 1839.

REVIEWS

Journal of a Residence in England, and of a Journey from and to Syria, of their Royal Highnesses Reeza Koolee Meerza, Najaf Koolee Meerza, and Taymoor Meerza, of Persia. 2 vols. Printed for private circulation.

Our readers cannot fail to remember the visit paid to this country in 1836, by the Persian princes, Reeza Koolee Meerza, Najaf Koolee Meerza (Wali), and Taymour Meerza, or the amusing narrative of their residence among us, subsequently published by Mr. Baillie Fraser, (*Athen.* No. 537-8). The present work is professedly a translation by Assaad Y. Kayat, who accompanied them as interpreter, from a journal kept by Najaf Koolee Meerza (Wali).

Such a work as is here announced, would assuredly be equally interesting and valuable. It is but seldom that this country has been visited by Asiatic travellers, men of distinction and intelligence, sufficiently informed to be capable of appreciating and comparing what they saw—and it would be amusing, if not instructive, to know the impressions made on such persons, not only by the country itself, in a national point of view, but by our habits, manners, and customs; by that which may be considered the business of our lives, as well as our amusements and pleasures: as observed in the preface, "Such a work might teach, by comparison, the state of civilization to which Britain has attained; the difference between those customs which belong to its own habits and prejudices, and those which are the result of experience, convenience, and prosperity." Whether the journal before us will fulfil this high purpose, and answer expectation, we must leave the reader to determine—we can only promise him a harmless and pleasant half hour's reading, since the work is "printed for private circulation only," and is not therefore open to criticism. One circumstance, however, we must advert to, because it will force itself on attention, even on reading the extracts here given: the work is professedly written by Najaf Koolee Meerza (Wali), who was indeed the literary man of the party—but throughout, not in one, but in fifty instances, it declares itself to be written by Reeza Koolee Meerza, the elder brother.

The work consists of three parts: an account of the accession of Mohammed Shah and the state of Persia—a journal of their voyage and residence in England—and of their return to Bagdad. We mean, of course, only to concern ourselves with what relates to England. The princes landed at Falmouth, and started by mail for Exeter; the following account of the country passed through, may amuse the reader by its oriental flourishing:—

"From the time that we left Falmouth till we arrived at London, we did not see a span of earth uninhabited. In all places along the roads and streets we observed men and women walking arm in arm; also coaches and carriages, in which there were ladies, like the houries, running in every direction; every moment increased our surprise, as we advanced. Even the peasants that dwell in villages have lofty and beautiful houses; outside of every house there are beautiful gardens, adorned with very fine flowers, where ladies splendidly dressed take their walks. All the time of our travels in this country, our eyes did not see a single handbreadth of earth, but all covered with delightful green, roses and all kinds of flowers guarded by the nightingales' singing. Such air and water are scarcely in the world, indeed what there is to be seen is enough to take away the senses. It is the first story of paradise, the majestic moon, the nightingales on the trees standing with pride, the roses resemble the cheeks of the inhabitants. At length, all this night we went on, passing by gardens, edifices, and lights, there was no darkness at all. In all the roads, there are lanterns lighted, also the houses give out their lights from the windows, in short, our travelling in midnight was not less pleasant than that of midday."

With Exeter they were delighted. The inn was a perfect palace; it is described as—

"A wonderful lofty building; consisting of many rooms which are royally furnished. These rooms have places for washing, the hot water was quite ready placed on the wash-hand table, standing before large looking-glasses, and towels hanging down exceedingly clean, with perfumed articles and fine soap. Every traveller is shown to a room to himself, attended by a servant. In every room there is a splendid bedstead with every thing belonging to it; ink and pen, with fine paper, are placed on a table, for the convenience of travellers. Fine-looking women also serve here, and everything is most desirable. The rooms for eating are separate from the bed-rooms; where there are fine large tables furnished with all sorts of eatables, both cooked and uncooked; everything that you may desire and imagine is placed on the table. Many people were sitting round the tables taking their breakfast, others reclining on the sofas. We were quite astonished at this house, and asked whose it was, and we were informed that it belonged to an individual whose business is to entertain strangers and travellers; and as he knows the time that the mails come in, all things are made ready for travellers to take their breakfast, that no time may be lost. Moreover, we were informed that there are in this city *about five thousand such public places;* each of them gains about 1,000 tomans per day; indeed the money here is like dust."

Bath, at which city they next stopped, excited still more astonishment, but they were quite lost in admiration of the women; and being detained there waiting for instructions from the government, it is recorded in their journal that—

"While we were sitting, when it was about the asser behold! a sun appeared from our east, shining and flashing. On seeing this incomparable beauty, and beholding this lovely face like the full moon, I lost my senses, not to say that I lost my sight, in admiration. No, my eyes, by beholding her smiling, became a hundred times more powerful. The delightful odour of her hair fell into my heart, and I was obliged to rise up and invite her to sit by my side, paying her all honourable respect. My heart died away, and unless my mind had gained strength to maintain conversation with this visitor, I should have appeared as if I were lost. I asked who she was. This full moon was the daughter of a captain in the East Indies."

On another occasion it is said:—

"From Friday the 11th to Monday the 14th, we had nothing to do but to continue looking at the beautiful Christian daughters. The least number that we ever saw in one day was about 5,000. Now the master of the place asked us whether we would allow the ladies to come to see us; of course I replied, 'Let them come.' Thus, all the day long we were engaged in receiving our most excellent visitors. Once we were sitting, when there came in sight a planet which dazzled our eyes as it rose up; I took courage and touched her beautiful jasmine hands, and invited her to sit down. What a life to the heart! how could the poor slave in love ask a kiss? What is the courage of a dervish to stand before this majesty?"

While the negotiation was going on with Lord Palmerston, "I thought it best," says the writer, "to send *my brother Wali* to London with Khoojah Assaad, accompanied with a letter *from me.*" How this and fifty like passages are to be reconciled to the statement that Wali is the writer of the journal, we leave to be determined by those who may come after us, and be called on to review the book when published, as we imagine it will be. "Wali," says the writer, had an audience with Lord Palmerston, "and sent *me* a full account of what had passed," but he did more, he sent an account of the Opera:—

"It is a very lofty edifice, built in a wonderful manner. From the roof of it to the ground, on the three sides round, there are small rooms made of wood, these they call boxes; these rooms or boxes are elegantly dressed up with woollen cloth and velvet; before every box there are forty chandeliers of cut glass, each has fifty lights; there are also lights in every part of this house. The forty chandeliers of cut glass, each containing forty lights, and each light of five branches, as well as the other lights, have one pipe, which, by touching an instrument, all the thousands of lights suddenly become dim, so that you scarcely see anything; and by moving the instrument differently, they as suddenly give a powerful light. There are young ladies with faces like the full moon, the beauty of whom makes the illumination of the sun dark; and a company of young men, whose beauty obscures the sun. Seats are provided below for the musicians; they play with instruments which nourish the heart: the pen and the tongue are incapable of giving an adequate description of them. * * There were in the boxes around, more than a thousand young and beautiful ladies, splendidly dressed with jewels; the beam of their beautiful faces illumines the place, the brilliancy of their sweet faces takes away the heart; my whole soul cried out to leave the body, that it might go near those houris. The heart beats with the ravishment of that sight. There are also distinguished places about this house, where are fine-looking women with arms like jasmine, and faces like a shining mirror; these handsome young women sell refreshments, and on the whole this place seems to furnish the nourishment of life."

The opera and ballet seem equally to have surpassed all imagination, and after filling page after page with description, he thus concludes: "What shall I say—what am I to write—to all this most wonderful, astonishing, amazing play? one imagines that he is in a dream." The brothers now arrived in London, and we have an account of their visit to the Zoological Gardens:

"There is no possibility of describing these strange and wonderful animals. For however they may be recollected in the mind or imagined in the head, these kinds of creatures cannot be described by the pen. There is to be seen an elephant twenty-four feet high, and *his proboscis forty feet long;* this wonderful elephant was brought from the extreme parts of the East India Islands. The tooth of this mountain-like beast stretches out like a long ivory promontory, and on the whole this animal presents a most frightful appearance. * * There is also one of the wonderful amphibious animals of a curious form. It is as large as a horse, it was brought from the interior of Africa. It is a very beautiful creature. When it stands and walks, it very much resembles mankind. All kinds of baboons of wonderful sizes and forms. They act like human beings; bears, white, red, green, yellow, and, indeed of all colours. Also a kind of monkey, which is of all the animals most like the human figure, the size of a mule, with an extraordinary long tail. These monkeys act like human beings, and laugh wonderfully, *and play at chess with men, and some of those that visit the gardens play with them. To-day, a Jew happened to be at this place, and went to play a game with the monkey.* The monkey beat, and began to laugh loudly, all the people standing round him. The Jew felt exceeding ashamed, and was obliged to leave immediately. The most wonderful animals of all, were a pair of creatures larger than an elephant, and higher than a camel, *their necks are fourteen feet long,* their legs are handsome, their tails are like that of an Arab horse of red colour, and with white spots on the face. They were brought from Africa, and their flesh is said to be excellent. They go as fast as a gazel: all the world from England, Scotland, and Ireland, come to see them. There are also *more than* 30,000 *kinds of birds:* in truth, we do not know how even to write their names, to describe their colours is impossible. *Some elephant birds just like an elephant,* but without a proboscis. *Their wings are about fifteen yards long.* * * Verily a visit to a place like this brings to the mind the power of the Omnipotent. The eyes are dazzled, the mind is surprised, the heart is agitated, and curiosity takes its utmost fill. *All this gives a most excellent opportunity to the lover, to lead his favourite by the hand to shew her this and that curiosity; besides all the above, you will see beautiful moonlike ladies, led by the hand,*

to gaze at these wonderful spectacles, and repose under the delightful shade of the beautiful trees. In truth, unless the eye should see, the mind cannot form an idea of this place."

We have fortunately nothing to do but smile, and conduct our readers to the Colosseum.

"Monday, the 7th, we went to a large edifice to inspect the English arts. We were guided up-stairs into a lofty place, where we were shown a room, and we were asked to sit down on the chairs in it; there were also some ladies and gentlemen seated on chairs by our side. As soon as we sat down, suddenly the room left its place, ascending up quite like an eagle, with large wings, into the atmosphere. After an hour's time, this bird folded its wings and stopped in the sky, then fortunately it opened its beak, and we went out. We came out of this room on a terrace, where there were a great number of men and women standing. This place affords a most beautiful view of the city of London, with the river Thames, and all England up to the sea; in the same manner are to be seen all the edifices, gardens, and the crowds of people in the streets in all quarters; and a great noise is heard of carriages, couches, and horses. In the river Thames we observed innumerable vessels like forests, many of which were at anchor, others under sail, and a great number of steamers going and coming at great rapidity. Many persons were going to church, others were taking walks, and some on horseback about the beautiful gardens. We had a spy-glass, which enabled us to see places at a great distance; such a command of a view surprises the mind. After I had a full view of the country, I said to Mr. Fraser that, although this is a very excellent view of London and of the country, yet I should like more to see and visit some of the English arts, and asked him to take us to such places, because what we see here we see every day. Mr. Fraser laughed at our question, and said, 'Is any art better than what you are actually now seeing?' What an art is it! we said; does any one doubt the power of the Creator, by whose order this world was created with its natural beauty? Then Mr. Fraser said, 'This heaven that you see is not more than four yards distant from you; if you throw an orange against it, it will return back to you; and that which you behold with your spy-glass is not more than ten pikes from you. The city and habitations, with the crowds of people in every direction are about this terrace, and they are not more than six yards in each direction.' I was angry with him at his saying this, it seemed as if he were playing with us. I said, 'O man, have we not eyes to distinguish between the real and artificial? Mr. Fraser replied, 'It would be impossible for you to know how this is done, unless you saw it.' Then he conducted us by some steps up where we saw the same spectacle, with this difference, the former was cloudy, and in this place the sun was shining. This increased our disbelief; however, we went up and down until we were satisfied all this miracle was simply produced by a picture, which causes all this wonder and astonishment. The air here is so shut out by the painting, as to make a philosophical illusion; in short, it is impossible to describe this wonderful picture; and we could not believe it until it was proved to us by examining the mystery which produces all these artificial realities."

Vauxhall comes next, and we confess it is the only description that ever recalled the impressions of our childhood:—

"In the evening, we visited a large garden, beautifully lighted up, and the fireworks that we saw here made us forget all others we had already seen. A garden, a heaven, large, adorned with roses of different colours in every direction, the water was running on the beautiful green, pictures were drawn on every wall. Here and there were young moonly faces selling refreshments. There were burning in this place about two millions of lights, each giving a different colour; the lanterns and lights are so arranged as to make poetry, in such a manner that they have no end. On every side there appeared the moon, and the sun, with the planets, each moving in its orbit; and in every walk there were about 10,000 Frank moons, walking and gazing about, where the roses and their tribes were admiring their beautiful cheeks. Each was taken by the hand, such a company in such a place says to the soul, Behold thy paradise!—pleasure and joy appear; woes and sorrows are banished;—every hand asked for a glass of refreshment to present to the possessors of jasmine hands. Thus we were happy to have in each hand a paradisean companion, and to point out the beauties of the place, in order to draw forth the sweet music of their replies; we left the rose and met a pink! are we awake or in a dream? We walked in this garden from one place to another, till we came to a place where we saw crowds of people gazing at a boy, elegantly clad, who was playing on a rope; now we were as though we had lost our mind. This rope was made fast high above in the garden, on which this boy was dancing; indeed, he was like a bird with wings in the air. Afterwards a young and beautiful girl, handsomely dressed, increased our surprise, she joined the boy, and they played together in a most wonderful manner, enough to take away the senses to look at them. When the boy and girl had finished their manœuvres, the people in the garden went to another place, where there was a wheel which was set on fire. As soon as it was lighted it began to ascend, throwing out fire of red, green, blue, yellow, and other colours wonderfully, as if all the world had taken fire, and continued to ascend till it reached the sky."

An account of the railways, and even a visit to the Thames Tunnel, we must pass. Of the Thames itself, however, it is observed—

"The ships on this river are like forests. The large men-of-war are 1,200 in number, some of which are of 120 guns; these, besides the packets and steamers. The least of their navy carries thirty guns. The British mercantile vessels are above 25,000, such is their extreme and extensive commerce. * * In fine, all the ships of other nations on the globe could not equal the number of the English ships alone, nor *ten foreign men-of-war stand in battle against one English;* they have always been victorious over their enemies. One of the twelve vizirs of government has the management of the navy; he is called the High Lord of the Admiralty; Lord Minto fills this high station at present. In his hand is the direction of the whole navy. Besides the above-mentioned ships, they have innumerable others in the West and East Indies, in America, and Australia, which are called out at the time of necessity. The water of the river Thames is very heavy, and *not at all good for the digestion, nor could it ever produce an appetite.* Yet *the people of this country do not use water as a drink;* when it is necessary *they take a little, once in three or four days.*"

Of the English generally it is remarked—

"The people of this kingdom are of genteel nature, and delicate constitution; most of the ladies, and females in general, are more delicate and refined than the blossom of roses. Their waist is more slender than a finger ring, their form is beautiful, their voice gains the affections. The men are very particular in their disputes, which are carried on with great ability. If there should be the widest possible misunderstanding, still they keep up the rules of politeness. If it should rise so high as to produce vindictive feeling, still they carry on their disputes in a genteel style, and bad language (God forbid!) is not used. To be called a liar is the utmost insult; this will lead to a duel; the duel is allowed here. Sometimes this happens in such circumstances as the following: If a man should be at an assembly, and should have something said to him improper or disgraceful, he who feels it to be such would at once leave the room. Then he will relate it to some friend, saying, that he heard so and so, at such a place, in such a party, which he did not like at all. Then his friend will reply, 'So and so perhaps did not intend to insult you, he might have said it by accident, write a note, and I will carry it to him, and learn more fully.' Then the plaintiff will write to him a respectful letter, as follows:—'At such and such a day, at such an assemblage, I heard you say such words, which made my heart feel angry, please to explain to me what you meant.' Then the friend will carry the note, and request an answer. If the object of the accused is not to insult him, he will write him an answer as follows:—'Upon my honour I never intended to create any displeasure in you, and should I have said anything which you consider improper, I now beg your pardon.' Such an answer will settle the question. But if otherwise, he will neither excuse himself nor beg pardon, but will answer as follows:—'I have received your letter, which I will thus answer: meet me on such a day, at such a place, and thereby you will be informed, and learn all the particulars.' This will give him to understand that the object is a duel. Then he informs his friends of it, and commences preparations to meet his opponent, and likewise the other will inform his friends that he has already appointed the time to fight with such a man. Then the friends of both endeavour to settle the question between them, but generally, this cannot be effected without fighting the duel. However, when all mediations fail, then the two individuals, accompanied by their respective friends as witnesses, meet at the appointed place, exactly at the fixed hour, which will be published in the newspapers. When the two come to this place with their pistols, then the friends use their utmost influence of mediation; if at last all should be vain, then they separate from each other a distance of twenty feet, and the signal will be given when both fire. Then it becomes a matter of chance; sometimes both of them are hit and perish, and perhaps no one is hit, or one dies, and the other is saved. Thus the question is finished: this act is permitted by their law, which does not condemn it; and it has been a well-known practice among the fools of this nation from the ancient times. It is quite similar to the old foolish custom of the heathens, who threw both the plaintiff and defendant into the fire, believing that the flame would only burn the criminal, and not the innocent. Thus, also, these people believe that the bullet will not hit the innocent."

The observations on the laws and government of the country are eulogistic, but brief. One or two of the facts may, however, be unknown to our readers. Thus it appears that every man in the kingdom has a vote, and that—

"Every person that has given ten tomâns of the revenue, in case he should see anything wrong in its expense, has a right to rise up in the House of Commons, and *seize the vizir of the Treasury by the collar*, saying, 'What have you done with my money?'"

Of the lighting of London, it is said—

"Another of their excellent arrangements, and which attracts much notice, are their lights during the night, which make the day and night to be nearly the same. In all their cities, towns, villages, hamlets, *mountains, hills, plains,* bazaars, and every street, light at night is just as it is in the day-time. This is effected by means of their conducting the light through pipes, as if it were a liquid, or water. This they call gas, or what we may call spirit of coals."

The account of our charitable institutions contains also some curious matters, not elsewhere recorded:—

"In charity, and supporting the poor and orphans, they are exceedingly liberal; so much so, that *they give ten per cent. per annum of their income to institutions of charity.* On account of the dear prices of living, there may be, out of the 27,000,000 of population, 7,000,000 poor; but *not a single person begs in the streets, nor in any part of the kingdom;* in fact, if there should be any one begging, he would be taken up immediately and punished for it, as it is against the law; because, in every quarter, there is a house built on purpose for charity, where the poor are accommodated. * * Perhaps, out of this 27,000,000 of population, *there is not a single soul who does not know how to read and write,* not even the dumb, deaf, or blind. They do not give credit for fine hand-writing; they say, writing is good enough if it can be read, and they do not spend the time simply in learning a beautiful hand. They have several thousand colleges and schools, for instructing in every class of learning, on which they have spent millions of money. All this for education and wisdom. Verily, such a magnificent kingdom and high nation is not, in these times, in any other part of the world, nor has such an one been, even in ancient times, mentioned in the histories. * * Their carts and carriages strike the observer very much. * * They have also instructed their large dogs even to draw carriages quickly. They are fond of dogs, and take pains to teach them to become useful; *they make them so serviceable, that sometimes they are sent on business.* For instance, *if a man wants something*

from a shop that is known to his dog, he will write a note to the shopkeeper, asking for what he may want, then he puts the note into a basket, and hangs it on the dog's neck, and gives him a sign. The dog will carry the message immediately, and return to the satisfaction of his master. Many other curious things are done by their dogs, not important to be mentioned. They do not keep any useless animal; all that they keep must be of use. If any should be of no use, they will dismiss them."

There are also some curious particulars relating to our domestic manners:—

"They have also some other regulations and customs, which I must not omit to mention, as they may furnish some useful information. One of them is, several thousand public-houses, for entertaining foreigners and travellers, and everybody. The first class of these houses is called, in the French language, 'Hotels,' which resemble the Persian caravansaries, yet the cost of each building simply must have been 200,000 tomâns, and the furniture is worth much more. All the plate for the table, and other vessels, are of gold and silver, and whatever you may think of you will find in these establishments. *It is not the custom of this country to receive anybody in their families, not even a friend nor a brother*, therefore it is necessary to lodge in an hotel, and all travellers in this country, even the natives themselves, go to these public-houses. For this reason they have built such splendid houses, capable of entertaining all kings, princes, vizirs, nobles, and gentlemen, who visit this kingdom, and take up their residence in them. In *every* hotel there will be *more than* 200 *servants, male and female*, who are ready at any moment to receive orders, both day and night."

Having now been presented at Court, the Princes received an invitation to Windsor:—

"This superior palace is situated in a garden, or park, *fifty-two miles in circumference*, which is *surrounded by a wall of iron bars, about three yards and a half high.* The park has *forty gates, splendidly wrought, and through it run several fine streams like rose-water*, and its trees are most noble, producing a beautiful shade. The carriage-roads are so finely paved, that a person might take his repose upon them. Roses of every kind, and flowers of every hue, are in this park. Its land is green, like emerald, its prospect is pleasure to the eye. Gazelles, antelopes, and deers, are here in thousands. Pheasants, partridges, woodcocks, and game of every kind, abound, all of which are enjoying this delightful place. Nightingales, goldfinches, and their associates, keep with their sweet voices watch in this garden. It is naturally carpeted with a beautiful green velvet. My pen tells me, do not proceed; I am incapable of describing it, it is Paradise. In one part of this Eden, there *is a hill, two miles in circumference, on which the palace is built*; it is *about* 2,000 *yards in height*, and affords a most beautiful view of the park. The mind cannot but be astonished at this splendid edifice, whose description exceeds the power of human writers. * * *Each of the kings, for* 200 *years past, has had a separate palace in this castle*, with distinct majestic splendour of sovereignty, *as may be now seen*, just as they were when these sovereigns occupied them. And *whatever unique jewels each sovereign obtained during his reign, are placed in his palace, with his statue, either of marble, jasper, or porphyry, seated on a jewelled throne;* so beautifully made, that you might say, it is alive, and can speak. One statue of a former king cost more than 12,000 tomâns. * * All his ministers and officers of state during his reign have also statues placed by him in the room, each with arms of the age, and appearing as if they were alive. In the royal rooms of the late kings, *all are seated on their thrones and chairs of gold, embroidered with precious stones, which cost millions of minted gold; each has his crown on his head of a hundred mauns of solid pure gold*, and *adorned with precious stones, so magnificent as to take the senses away. These crowns are supported by chains of gold, and suspended over the heads of the sovereigns.*"

What all this means, it is utterly beyond our power even to conjecture; but we shall proceed:

"We also noticed several rooms, three hundred feet long, and a hundred broad, all adorned with beautiful pictures. These are for balls, where the King and Queen invite their noble guests; the King himself dances, and the Queen also with whom she pleases. *When such balls take place, the sounds of the musical instruments in these rooms are heard at a distance of twenty miles.*"

On their return to town, the Princes visited the "Opera of the Horse," that is, Astley's, and on that day "*fifty thousand ladies*" were present, and gave splendour to the place." After this, they went to a cutler's shop, and saw "*two million of knives, of different descriptions.*" We learn, too, from this work, that there are *about two millions of stage-coaches* in the United Kingdom; that many houses have *gold knockers, of a hundred tomâns value*; that there are *more than five hundred thousand clocks* fixed on the churches and other edifices in London:—but our readers, we suppose, must, by this time, have had enough.

The Mansions of England in the Olden Time. By Joseph Nash. M'Lean.

The old houses of the Tudor times, which constitute our only claim to the credit of a national style of domestic architecture, are fast hastening to decay; and the pert dapper villas, and larger buildings of nondescript fashion, that succeed to their quaint and gloomy grandeur, increase our reverence for these venerable relics of Elizabethan state. The fashion for "the old English style," as every absurd combination of gothic and gables is now called, probably suggested the present work; but be this as it may, Mr. Nash has made it very pleasing and picturesque by his mode of treating his subjects; and moreover the style of art, the tinted lithography, now so popular, has never been more successfully adopted, with reference to its most valuable characteristic, namely, artist-like freedom of touch and power of effect. Eschewing the formal elevations and perspective views of the mere architectural draughtsman, and the scarcely less bald and mechanical literalities of the antiquarian sketcher, who portrays the progress of dilapidation with painful fidelity, the artist has exercised a painter's fancy in depicting the antique features that remain of the several buildings, under such aspects as we may suppose them to have assumed in by-gone days. He has evoked the spirit of the past to give life and animation to the scene: the cold hearth is again warm and bright with the faggot's blaze, and the sunlight streams through the blazoned lattice of the mullioned windows; the lover touches the lute to his mistress, the dutiful daughter sits reading to her grandsire, the tables are spread in the hall, the falconer issues forth with hawk and hound, the tired sportsman sleeps in his chair with his dogs at his feet, the cavaliers play bowls on the lawn, and the household enjoy their Christmas gambols in the hall with the noisy rout of mummers and morris-dancers: the costumes of the groups vary from those of Henry VI. to the time of Vandyke, the faces and air of the persons also partaking of the ancient character. But in thus making his old buildings the backgrounds of lively pictures of old English life and costume, the artist has not neglected their architectural features, which are by no means subordinate: his selection of specimens has been so partial and random, however, that a second volume at least is necessary to embrace the whole of the subject; but there is nothing introduced which is superfluous or uncharacteristic; and the effect of the whole is a rich variety. To Haddon, five plates are devoted; we have the hall, the chapel, the long gallery, and two bays in the drawing and dining rooms: and to Ockwells—a curious and perfect specimen of the gabled manor-house of Henry VI.'s time, near Bray and Maidenhead, formerly belonging to the family of Norreys, whose arms and motto are still seen in the windows of the hall, but now a farm-house—four, showing the front with its delicately carved gable-boards, the hall with its timber-framed roof, and the narrow lobby and porch. Of Hatfield, Bramshill, and Holland Houses, and Wakehurst, a curious little brick manor house in Sussex, we have, two views each: and amongst other characterestic points we note the following; the timber-framed roof of the hall at Beddinton, in Surrey; the waggon-ceiled drawing room at Boughton Malherbe, in Kent, decorated with Moorish pattern scrolls; Sutton Place, near Guildford, its front decorated with red tiles ornamented with figures of cupids in relief, and with the initials and cognizance of the Weston Family; the richly-carved staircase of Crewe Hall, Cheshire, with its many landing places; and the Hall of Franks, near Dartford, built by a London Alderman in Elizabeth's time, and having a gallery at one end, closed by a lattice as usual, to admit of the master or mistress observing the doings below.

Reverting to the execution of the drawings, we are induced, by the entirely new character that lithography has assumed within these few years, and the remarkable capabilities the art has lately manifested, to devote more than usual space to a consideration of this new method of reproducing sketches. When, four years ago, Mr. Harding published his 'Sketches at Home and Abroad,' in which he developed so ably the improvements made in the process and tools of the art by the printer Hullmandel, we were inclined to think that to his dexterity and practical experience of lithography was owing much of the beautiful effects caused by the graduation of the neutral tint to bright light, and the softening of the black shadows by the use of the stump: since that time, however, a long line of Sketch-books has appeared, in which similar effects have been produced by the same means, though with various degrees of success; and by no artist with so much of the painter's feeling as by Mr. Nash. The draughtsmen who fac-similed Roberts's and Stanfield's Sketches, and even Mr. Haghe (painter though he be) in his finished versions of Mr. Vivian's Spanish and Portuguese views, have given a character of studied formality and coldness to their drawings, that however much we admire them they still have the look of copies: they show too much of the draughtsman and too little of the painter. Now we find nothing of this in these drawings of Mr. Nash, which are distinguished for the pictorial quality, which appears to us to constitute the great charm of the new style of lithography. It was painful to see the labour wasted by bunglers in attempts to imitate in lithography the effects of engraving, which Lane only has succeeded in rivalling: a crude, coarse print, varying from smudgy blackness to a foggy grayness, but always destitute of tone, and with imperfect middle tints, was all that could be got; or if neutral tint were superadded to harmonize and mellow the whole, it threw a horn-lantern dimness over defects, without remedying them: the black and white drawing and the neutral tint were always two different things, and often at variance; as inkblack and colour, however neutralized, must always be. This was in a great measure obviated by Harding's white lights being graduated into the neutral tint, and the softened edges of the demi-tones in his black drawings melting into the tint also: yet when the neutral tint was of a warm hue, primrose or other shades of yellow, the black did not blend and harmonize with it, and even with the colder gray hues the union was not perfect. Haghe, and Bourne in his clever sketches of the Birmingham Railway, are fond of cold tints; but the white then looks like snow; the atmosphere has a frosty appearance; and notwithstanding the cleanness of the drawing and the clearness of the black tints, a coaly hue is discernible in the darks. Nor are Nash's drawings entirely free from this inevitable effect of the opposition of soot-black to a coloured hue: we too often see where the black drawing ends and the tint begins. The tint, to be perfect in its effect, should blend with the drawing, so that the impression should appear to be perfectly homogeneous: this effect, so desirable, is seen in the light drawings with light tints,—such, for example, as the staircases of Hatfield and Holland Houses and Wakehurst, and the Hall, Ockwells; in the hall, Hatfield, and the drawing-room, Boughton Malherbe, the tints are too opaque, as if to keep in countenance the heavy tints of the drawing; and the powerful effect of an admirable picture of the slumbering sportsmen at 'Southam,' where the slant rays of an evening sun are illumining the apartment, is injured by the coarse blackness of the shadows. These drawings make us critical by their very excellence; we would have them perfect in effect: and they might be made so with a very little care. By simply infusing a warm hue of deep brown into the printing ink, the half tones of the drawing would blend in with the tint; and this again might be lighter and more transparent, so as to melt imperceptibly into the gradations of light: the modification would not militate against the bril-

liancy of the deep shades, for it need be very slight, resembling sepia; and the superior warmth and richness in the shadows and purity in the lights would more than compensate for any loss of that startling effect caused by the opposition of intense black to the middle tint. The ruddy glare of light and the hot shadows in a torch-lit room would be much more truly and agreeably rendered by a reddish-yellow tint over reddish-brown drawing, than, in the night scene at Haddon Hall, by opaque yellow over black—though, so far as the arrangement of lights and shadows goes, the print as it is conveys a good idea of the effect intended.

In offering these suggestions, we must not be misunderstood as making any objection to the execution of these drawings, or the printing: both the artist and the printer merit the highest praise. The daylight warmth and brightness of many of the views are quite cheering: you feel that the room is full of sunshine—it pours in through the windows, and glows on the wall, and is reflected from floor and ceiling. The almost illusory completeness with which both the solid substance of stone, and the transparent surface of windows flooded with light are imitated, is remarkable: in the management of these effects Mr. Nash is particularly happy—we quite bask in his warm atmosphere.

In connexion with this mention of the new process of lithography, we may allude to specimens issued of a work to be printed in colours from stone,—Architectural Sketches by Mr. Thomas Boys: we are not in the habit of noticing 'Specimens,' but the merit of these is so extraordinary, there is so much of the quality of fine art in these products of the press, that we are tempted to say a word. The two specimens are different: one, a view of the Hotel Cluny, Paris, looks like a black and white print coloured; the other, a street scene in Rouen, has all the appearance of a powerful water-colour drawing, at first sight: neither has that superficial glare and gaudiness which make coloured prints so offensive; the great defect is in the registering of the impressions from the several stones, which is not perfect; and it may be doubted whether the intensity of the several tints will be accurately preserved in due proportions. The work, however, will show.

The Mabinogion, &c.; with an English Translation, and Notes. By Lady C. Guest. Part II. containing *Peredur the Son of Evrawc.* Longman & Co.

On the publication of the first part of this treasury of legends, the qualifications of Lady C. Guest, as a translator and editor, were fully considered, and her zeal and liberality honourably noticed (*Athen.* No. 578). We may now, therefore, proceed at once, and without further preface, to this second legend from the Red Book of Hergest. Be it premised, however, that we have not read this tale of Peredur with the same antiquarian eyes which pored over 'The Lady and the Fountain,' in November last. Why should not we, being men as well as critics, fall in with the humour of the hour, and while other people hurry *by railroads* to Eglintoun, to see steeds caracole, and knights unhorsed;

> While store of ladies, whose bright eyes
> Rain influence——

But *rain* is an ugly word, and has taken the romance out of us as effectually as the opening of the tale before us; from which we learn, that Peredur was the seventh son of an Earl Evrawc, who, oh horror! maintained himself, like a modern prize-fighter, by "attending tournaments," &c., and was thus slain, with six of his sons, while striving for a maintenance:—

"Earl Evrawc owned the Earldom of the North. And he had seven sons. And Evrawc *maintained himself not so much by his own possessions as by attending tournaments*, and wars, and combats. And, as it often befalls those who join in encounters and wars, he was slain, and six of his sons likewise."

So much for romance! The Earl's widow, "a scheming and thoughtful woman," being very solicitous concerning Peredur, who was too young to be slain after the like fashion, withdrew with him into lonely and uninhabited places; and further, that her last hope might not set his mind upon horses and arms, "she permitted none to bear her company, but women and boys, and spiritless men, who were both unaccustomed and unequal to wars and fightings." But nature was stronger than the widow of Earl Evrawc, and no wilderness was so lonely in those days, but that knights might be seen "coming along the horse-road" on its borders. Nor was the mother's account of these knights, when, to the eager boy's inquiry, she answered that they "were angels," satisfactory enough to hinder him from saying, "By my faith, I will go and become an angel with them." It was in vain to attempt longer to tame his wild spirit; and though the Countess was tender-hearted enough to swoon away, when Peredur, coming back from his rencontre with the strangers, declared them to be "not angels, but honourable knights,"—she was also sufficiently discreet to refrain from further management; nay more, to send her son forth fortified by precious rules of conduct:—

"And Peredur went to the place where they kept the horses that carried firewood, and that brought meat and drink from the inhabited country to the desert. And he took a bony piebald horse, which seemed to him the strongest of them. And he pressed a pack into the form of a saddle, and with twisted twigs he imitated the trappings which he had seen upon the horses. And when Peredur came again to his mother, the Countess had recovered from her swoon. 'My son,' said she, 'desirest thou to ride forth?' 'Yes, with thy leave,' said he. 'Wait, then, that I may counsel thee before thou goest.' 'Willingly,' he answered, 'speak quickly.' 'Go forward,' then she said, 'to the court of Arthur, where there are the best, and the boldest, and the most bountiful of men. And wherever *thou seest a church, repeat there thy Paternoster* unto it. And *if thou see meat and drink*, and hast need of them, and none have the kindness or the courtesy to give them to thee, *take them thyself.* If thou hear an outcry, proceed towards it, especially if it be the outcry of a woman. *If thou see a fair jewel, possess thyself of it, and give it to another, for thus shalt thou obtain praise. If thou see a fair woman, pay thy court to her, whether she will or no*; for thus thou wilt render thyself *a better and more esteemed man* than thou wast before.'"

There's pretty schooling for an earl's son! It will not be thought strange that, with so much natural vivacity, and thus prudently instructed, Peredur, ere long, parted company with his Rozinante and its wicker saddle. But, having ridden to King Arthur's Court, he was insulted for the poverty of his accoutrements, by tall Kai, who refused to introduce him to the king, declaring him too meanly appointed to merit the honour of knighthood;—whereupon the ill-trained household, after the fashion of certain great men's servants, even to the present time, "threw sticks at him." A couple of dwarfs, however, who had been mute till then, ever since they had been harboured at that court, welcomed the youth in high strains, after the prophetic fashion of the weird sisters; for which ill-timed piece of fore-knowledge, Kai boxed the male, and kicked the female, till both were senseless! Nevertheless, anxious to get rid of so ill-conditioned a claimant, Kai told Peredur, that if he would follow a knight, who had gone thence but a while since, and possess himself of his horse, and arms, and goblet, he should then receive the honour he coveted. Peredur, nothing loth, followed the knight to the meadow, where the latter "was riding up and down, proud of his strength, and valour, and noble mein;" and so laid about him with a sharp-pointed fork, that the better accoutred champion was fain to yield; and Peredur was pronounced qualified for knighthood. But now, with the true pride of chivalry, when summoned to King Arthur's presence to receive the meed of his valour:—

"'May I never show my face again, if I go,' said Peredur, 'but take thou the goblet to Gwenhwyvar, and tell Arthur, that wherever I am, I will be his vassal, and will do him what profit and service I am able. And say that I will not come to his Court, until I have encountered the tall man that is there, to revenge the injury he did to the dwarf and dwarfess.' And Owain went back to the Court, and related all these things to Arthur and Gwenhwyvar, and to all the household."

And therewith Peredur rode forward in quest of adventures. Here we must leave him. To this point his history is that of the universal man—the old tale once again told, of the struggles of youth, and high spirit against poverty of condition—and of the conquest which all those who will, *may* gain. From this point forward, the knight errant of the 'Romaunt' predominates; and the scene is made up of enchanted castles, ogres, a gigantic spear dropping blood, and a maiden, whose whiteness was "like that of the snow, and the blackness of her hair and eyebrows was like that of the raven, and the two red spots on her cheeks like drops of blood." These, by the way, are the chosen colours of the heroines of all faëry tales, in all lands: but a few days since we were reading of precisely such another damsel, in Carlo Gozzi's 'Corvo,' which is founded on an ancient Italian *fiaba.* But it would be beyond our present purpose to enter into the amusing chapter of coincidences and identities. We will therefore here close our few words concerning the adventures of Peredur the son of Evrawc.

The Life and Times of Sir Thomas Gresham.
[Second Notice.]

During the reign of Mary, Gresham appears to have resided principally at Antwerp, even when not officially employed, and to have pursued his private business as a merchant. No sooner, however, had Elizabeth ascended the throne, than he was reinstated in office, and his services put in requisition. On this occasion, he addressed a letter to the Queen, on the subject of finance, which is worthy of attentive perusal: in brief, he submits—

"An it please your Majestie to restore this your reallme into such estate as heretofore it hath bene,—First, your hyghnes hath none other wayes, butt, when time and opertunyty serveth, to bringe your base mony into fine, of xi ounces fine. And so, gowlde, after the rate.

"Secondly, nott to restore the Still-yarde to their usorped privelidge.

"Thirdly, to grant as few licences as you can.

"Fowerthly, to come in as small debt as you can beyond seas.

"Fiftly, to keep your credit; and specially with your owne marchants; for it is they [who] must stand by you, at all eventes in your necessity."

Subsequently, Gresham resided much in London, leaving the management of his affairs at Antwerp to Richard Clough—an intelligent person, in whose integrity he had entire confidence, but who, as Gresham says, in a letter to Cecil, was "very long and tedious in writing." These long and tedious letters, however, with all their elaborate minuteness, are of especial interest at the present day. Clough subsequently married that remarkable woman, Katherine Tudor, better known as Katherine of Berain, sole daughter and heiress of Tudor ap Robert Fycham, by the grand-daughter of King Henry the Seventh:—

"Of the charms of this celebrated lady, (says Mr. Burgon,) the numerous portraits of her, preserved in Wales, are indisputable evidence; and that she was gifted with corresponding powers of pleasing may be inferred from the circumstance, that when the death of Richard Clough had left her for the second time a widow, she became the wife of Morris Wynn of Gwydyr; after whose death she still had smiles left for a fourth and last husband, Edward Thelwall of Plâs y Ward, Esquire. Tradition has been ill-natured enough to preserve an anecdote of the heiress

of Berain, which, if true, however creditable to her charms, reflects no honour on her heart. Her first husband was John Salusbury, heir of Lleweni; at whose funeral, it is said, she was led to church by Richard Clough, and afterwards conducted home by the youthful Morris Wynn, who availed himself of that opportunity to whisper his wish to become her second husband. She is said to have civilly refused his offer; stating, that on her way to church she had accepted a similar proposal from Richard Clough: but she consoled Wynn with the assurance, that if she survived her second husband, he might depend on becoming her third; and she was not unmindful of her promise."

At this period, Sir T. Gresham resided in Lombard Street:—

"Like all other bankers and merchants living in that street, he kept a shop. It stood on the site now occupied by the banking-house of Messrs. Stone, Martin & Co., and over his door was his crest, a grasshopper, by way of sign. This was no uncommon practice even at a later period; for we are told that the sign of the house in Bread-street, where Milton's father resided, and where Milton was born, was *the spread eagle*,—an heraldic symbol, which appears in the family arms. The original sign of Gresham's shop was seen by Pennant, and I am informed continued in existence as lately as the year 1795; when, on the erection of the present building, it disappeared from the station which it had so long occupied over the door: its metallic value having probably aroused the cupidity of some of the labourers. But the term *banker*, when applied to a former age, is so likely to produce misconception, that before proceeding further, it seems advisable to explain it. A banker in early times pursued a very different trade from that which occupies the attention of the opulent and influential class so called at the present day. It is well known that the latter derive their profits from the employment of fluctuating sums of money, deposited in their hands for convenience and safety by the public; and for the security of which, the respectability of the banker is a sufficient guarantee. But this is a refinement of comparatively recent introduction, with which our forefathers were wholly unacquainted. As late as the time of Swift, bankers gave and took a bond on receiving and lending money; and made their profit by obtaining a higher rate of interest, or usury as it was called, on the latter operation, than they allowed on the former. Ten or twelve *per cent.* was the customary rate of interest during the reign of Queen Elizabeth; at which period, we mean no disrespect to the banker when we say, that he united in his person the trades of the usurer, the pawnbroker, the money-scrivener, the goldsmith, and the dealer in bullion. A German traveller who visited England in 1593, says, that he saw in Lombard-street 'all sorts of gold and silver vessels exposed to sale, as well as ancient and modern coins, in such quantities as must surprise a man the first time he sees and considers them.' At the period of Gresham's death, a considerable portion of his wealth consisted of gold chains."

In February 1559-60, Gresham was appointed Ambassador at the Court of the Regent in the Low Countries. Though his correspondence is, in general, strictly confined to matters of business, still there are passages which show that he was occasionally employed on trifling matters, of personal interest only to his courtier friends. Mr. Burgon has selected a few of these:—

"'Sir,' says Gresham, addressing Sir William Cecil in 1560, 'it may please you to doo my most humble commendacion to my Lorde Robert Dudeley, and to declare unto him that the Queen's Majesty's Turkey horse doth begynne to mend in his foote and body; which doughtless ys one of the readdyst horsses that ys in all Christendom, and runs the best.' In about a month, he adds, (writing to Sir Thomas Parry) 'It may please you to show my Lord Robert, that the Queen's Majesty's Turkey horse waxes a very fayre beast; and with the Queen's Majesty's leve, I doo intend to bring [it] home myselfe.' In a letter addressed shortly after to the same individual, Gresham says, 'I thank you for the gentill entertainment you gave to my poore wyffe, who I do right well know molests you dayly for my coming home,—suche is the fondness of women! And whereas your honour would have a great Iron chest bought for the Queen's Majestye, with a littil keye, I have sent you the keye of the fairest Chest that ys to be had in all this town, if the key be not too bigge. Iff the Queen's Majesty would have lesse, I pray you that I may know the length, and I shall cause a chest to be mayd purposely:' and in the following August, addressing the same personage, Gresham says, 'I sent you on the 17th overland, to Dunkirk, the young cortall I gave you with the Queen's Majesty's Turkey horse. As lickewise I have sent you four dozen of the same black buttons you spake to me for, which costes you 48*s.* the dozen.' 'The man that maketh the clock is out of town, this Easter hollidayes,' observes Gresham, addressing Sir William Cecil: 'I trust to send you it within these x days.' In another letter he says, 'I have written into Spayne for sylk hose both for you, and my Lady your wife: to whom it may please you, I maye be remembered:' and we learn from the letter which a few days after accompanied the gift, that those for Cecil were black. 'I have sent you herewith two payre of blacke silke howsen, and payre for my Lady your wiffe.' Silk stockings were, in fact, at this time of great rarity and value."

Gresham's old enemy, the Marquis of Winchester, was now again attempting to bring him into disgrace, by insinuating to the Queen that he availed himself unfairly of his advantageous position. The truth appears to have been, that the Lord Treasurer was jealous of the secrecy with which Gresham conducted his operations, who, instead of communicating through the ordinary official channel, wrote directly to Cecil, or, in his absence, to Sir Thomas Parry. On this occasion, Gresham addressed the following letter to the latter:—

"Sir, I do perceive bye my servant, that my lorde Treassorer is offendyd with me because he ys not privey to all my doings; wyche I cannot doo withe-all, for that I was commanded by the Queene's Majestie to make no man privey [to them] but you and Mr. Secretarye. ..... This is the thyrde time that my Lord Treasurer hath servyd me this, viz. once in King Edward's time, and once in Quene Mary's time: and when his Lordship came to see the state of myne account, a found the Prynce rather in my debt than other wysse. And I assure your honour, of my faythe and powre honesty, it shall fall out so now.' Two days after, Gresham says,—'This is one of his Lordship's old practisses, who cares nott how things passith here, so his Lordship's torne be servyd there.' He protests his innocence, 'whatsoever my L. Treasurer has put in her highness head to the contrary;' and in less than a week recurs to the same theme, for it seems to have given him great anxiety, and made him very unhappy: 'It ys a hevye care that so honourable a man as my Lord Treasourer ys, (and of thosse auncient yeres, and so experymentyd in prynssys affaires!) that ever a wolld inforn the Soverayne with half a tale, to the discredit or undoing of anny man; and specyall of him that was absent, and not able to answhere for himselffe. According as I have writtin you, this ys the thyrd tyme that my lord Treasurer hath servid me this. All be it, caulling to remembrans the faythefull pronfes that it pleasid the Quene's Majestie to macke unto me at her highnesse howse at Hatefull [Hatfield] when her highnes came to the crowen, ... what soever her Majestie ys informyd of me in this my absens, I trust in God, her Majestie, according to her promis, *will keep one ear shut to hear me*, till yt please her highnes to lyssens me to come home; which is the thinge [which] is now my wholle comfort: to the wyche I doo refer me.' Parry was a good friend to Gresham. He not only counteracted the evil intentions of the lord-treasurer, by speaking to Queen Elizabeth in favour of her merchant, but he conciliated the Lord Hunsdon, who, instigated probably by Winchester, had not scrupled to express his dissatisfaction openly: 'My factor, Richard Candiller, writes me that my lorde of Hunnsdone said unto hym that 'a dyd moche marvill that the Queene's Majestie's harnes came none other ways home; wherein I had moche disappoyntyd her highness; and that he thought I hade sold her harnys to the marchaunts in London, for leuccar and gayen.' Sir, I cannot but marvyll that his Lordshipe wold make anny soche reporte upon me. For as the Queene's Majestie and you do right well knowe, I have allreddy sent home from this town of Andwerpe viij M corseletts; and then, (my pasportes being bannyshyd,) I was fayen to transporte all my armeur, and other munission out of Germany, to Handborow; whereas there hathe bynne for the spasse of iiij monthes, V or vj M harnys, and other provyssiones, for the some of XX M *li.*; and dayly there ys transporttyd thither from all places, as they can get carrage. Whyce masse laye there, for that the Queene's Majestie of long tyme wolde not venter above vi c *li.* in a ship: whyche, as the x^th^ of Maye last past, I gat enlargyd to shipe in every bottome ij M *li.*, with longe sewte; for that there ys not passing xij shipes that lades from thens to London in the whole yere. And yett [further] for the more exspedycione, fering that thinges shuld be callid for, (as they be now,) I have adventoryd upon my own head, one thowssonde powndes more in a shipe; wych I have caussyd to be assewred upon the Bursse of Andwerpe. So that I trust in God it shall most playnly apere to the Queene's Majestie I have done my dewtye, and dilligens; according to the trust her highness hathe reposed in me. Being right assured, the like was never done by no subject: and (here writing unto your honour) there ys as moche done as maye be done, by wit of man. ..... Therefore, I shall most humbly desire your honnor, as to give my Lorde of Hunsdone to undyrstand how all things standyth; and all other that haythe the charge of the receipt of those provissions I have made: for, an my life lay on it, I can doo no more. Assewring you, Sir, it is no smalle greffe unto me to here of anny complante to be maid of me; considering the great care, and travallye, and sorrow I have had, to bringe all these thinges to so good purpose: wherein I must confess I have done but my dewtye to her Majestie, an it hadd bene x tymes more.' The subject of dissatisfaction with Lord Hunsdon is quite in character; and was just such as might have been expected to have had most weight with that high-spirited, warlike peer: but he was soon reconciled to our merchant; 'Perceiving,' writes Gresham to Parry, on the 2nd of July, 'the Queene's Majestie and you ys fully satisfied in that behalf, as also you have satisfied my Lord of Hunsdon, and that he hath always been my good Lord, and will so continew; for the wyche I thanck him: to whom yt may please you to do my most humble commendacions.'"

But we must push on to that event which, above all others, has rendered Gresham memorable—the founding of the Royal Exchange. In 1564, Gresham lost his only son; and Mr. Burgon is of opinion, that the building of the Exchange was, in some degree, the result of this sad bereavement; and that he sought, by this means, to employ usefully a portion of his wealth, and to divert his melancholy. It further appears, from the Minutes of the Court of Aldermen—

"That on the 4th of January, 1564-5, a proposal was made to the court by Sir Thomas Gresham, (through his servant, Anthony Strynger,) that a Burse or Exchange should be built in London at his expense for the accommodation of merchants, provided a site was found on which the edifice might be conveniently erected. * * The want of such a building was at that time severely felt in London. Hitherto, Lombard-street had been used for this purpose: and here 'the merchants and tradesmen, as well English as strangers, for their generall making of bargaines, contracts, and commerce, ...did usually meete twice every day,'—at noon, and in the evening: 'but their meetings were unpleasant and troublesome, by reason of walking and talking in an open narrow streete, ...being there constrained either to endure all extreamities of weather, viz. heat and cold, snow and raine; or else to shelter themselves in shoppes.'"

In 1566, the sum of 3,737*l.* 0*s.* 6*d.* was subscribed, in small sums, by about 750 citizens, whose names are recorded; the old houses which occupied the site on which the Exchange was subsequently built were purchased, and pulled down, and the ground formally assigned to Sir Thomas Gresham. The first stone of the new building was laid on the 7th of June, 1566.

From the letters brought forward by Mr. Burgon, there can be little doubt that the principal materials—the stone, the iron, the slates—were brought from Flanders; and the work, it is known, was carried on by a Flemish architect, and conducted by a Flemish carpenter. There is a tradition, however, that the timber came from Gresham's estate, in Suffolk, and that the framework was all there constructed. Something like evidence of this is believed to be remaining even to the present day:—

"This *Tye*, or Battisford Common, (says our author,) was formerly thickly wooded, and here may be traced five or six saw-pits, of about the usual size, at equal distances from each other, so marked in their shape and character, as to preclude the possibility of any mistake as to their nature; and according to the current tradition, they are the same which Gresham employed in the construction of the framework of his Burse. The story has, it must be confessed, at first sight, rather an apocryphal air; but there is nothing unreasonable, much less impossible, in the circumstance that some traces should still be discoverable of an undertaking, to ensure the successful performance of which, less preparations could not have been made: and the following entry in a MS. history of Suffolk families, written in 1665, goes far towards setting at rest the question of the identity of the pits at present visible, with those excavated by the subject of our narrative: 'Upon which Tye or Common [alluding to Gresham's manor of Battisford] the Royal Exchange was framed; *and the sawing-pitts remain there still.* And most, or at least a great part of the timber wherewith the said Exchange was built, was taken off the now lands, belonging to the demesnes of the said mannor of St. John's.'"

Soon after its completion, Elizabeth signified her intention of visiting the founder, and inspecting the building, the architectural character of which is well known:—

"There were walks above as well as below; the upper part of the building being divided into no less than one hundred small shops, from the rents of which Gresham proposed, in part, to reimburse himself for his outlay in its erection. An equal number of vaults were also dug beneath, adapted for the reception of merchandise; but these were found to be so dark and damp, that they soon became of little value. Desirable for the display of wares as a shop must have been in a place of so much resort as the Burse, we learn from the chronicler who interested himself most in the history of the city, that for two or three years after its erection the shops remained 'in a manner empty.' Queen Elizabeth, however, having signified her intention of visiting the founder, and in person inspecting and naming his edifice, Gresham naturally became anxious to improve its appearance, and render it fitter for the reception of his royal guest. 'He went,' in consequence, says Stowe, 'twise in one day round about the upper pawne, and besought those few shoppe-keepers then present, that they would furnish and adorne with wares, and waxe lights, as many shops as they either could or would, and they should have all those shops so furnished rent-free that yeere; which, other wayes, at that time was forty-shillings a shoppe by the yeere. And within two yeres after, hee raysed that rent unto foure marks a yeere; and within a while after that, hee raised his rent of every shoppe unto foure pounds tenne shillings a yeere, and then all shoppes were well furnished according to that time; for then the milliners or haberdashers in that place solde mouse-trappes, bird-cages, shooing-horns, lanthorns, and Jewes-trumpes, &c. There was also at that time that kept shoppes in the upper pawne of the Royall Exchange,—armorours, that sold both olde and new armor, apothecaries, bookesellers, goldsmiths, and glasse-sellers; although now it is as plenteously stored with all kinde of rich wares and fine commodities, as any particular place in Europe. Unto which place many forraine Princes dayly send, to be served of the best sort.' It was in consequence of the season of the year at which Queen Elizabeth made her progress into the city, that Gresham required the aid of illumination to set off the Burse to advantage. Stowe relates, that on the 23rd of January, 1570-1, 'the Queen's Majesty, attended with her nobility, came from her house at the Strande, called Somerset-House, and entered the citie by Temple-bar, through Fleete-streete, Cheap, and so by the north side of the Burse, to Sir Thomas Gresham's in Bishopsgate-streete, where she dined. After dinner, her Majestie returning through Cornhill, entered the Burse on the south side; and after that she had viewed every part thereof above the ground, especially the pawne, which was richly furnished with all sorts of the finest wares in the city, she caused the same Burse by an herralde and a trompet to be proclaimed the *Royal Exchange*, and so to be called from thenceforth, and not otherwise.'"

We have left ourselves room only to notice the death of Gresham, which took place suddenly on the 21st of November, 1579:—

"Thus, at the age of sixty, after having served the state for nearly thirty years with unsullied honour and integrity, died Sir Thomas Gresham,—one of the most illustrious names of which the annals of our metropolis can boast. He found the credit of the crown in foreign parts reduced to the lowest ebb; but raised it by his prudent management, and left it higher than that of any other power: at the same time, by the skill with which he contrived to control the exchange with foreign countries, he may be considered to have laid the foundation of England's commercial greatness; thereby making the balance of trade preponderate in its favour: so that a late writer has not unaptly styled him 'the great patriarch of commerce and commercial finance.' He elevated the character of the English merchant, and was one of the first to dignify the pursuits of trade, by showing that they are far from being incompatible with a taste for learning; and in the latest actions of his life, he in a manner restored to the state the fortune he had acquired in its service, by numberless acts of public munificence and private charity. He was a true patriot."

OUR LIBRARY TABLE.

Prodromus; or, an Inquiry into the First Principles of Reasoning, by Sir G. C. Haughton, F.R.S. &c.—*Outlines of Analogical Philosophy*, by George Field, 2 vols.—While the physical and mathematical sciences have during the last century been cultivated with a zeal and success surpassing the hopes of the great men who, at the revival of literature, gave a new impulse to these studies, the mental and moral sciences have been allowed to rest in cold obstruction; few have attempted their cultivation, and those few find it difficult to obtain an audience. Colman's description of metaphysics appears, indeed, to be universally adopted:—

> Mallebranche and Locke, and such grave fellows,
> With other metaphysicians, tell us
> Much about mind: when you have read
> All these philosophers have said,
> You'll give them credit for their perspicuity;
> And afterwards,—if you have got a head
> Of no great autological capacity,
> You'll know as much
> About the matter as you know of Dutch:
> For if but once a metaphysic chain
> Should get entangled in your brain,
> The more you rattle it, the more you rave,
> And curse, and swear, and misbelieve,
> Coming to no conclusion:
> And if you do but lose the smallest link,
> You may as well go whistle as to think
> Of mending the confusion.

In these days of "knowledge made easy," a branch of study, such as that which Colman has described, can have little chance in competition with party-politics, railways, steam-engines, and sectarian controversy; the practical business of life affords but few leisure hours for abstruse speculation; we must, therefore, run lightly over ground in which only a small minority takes interest, and leave metaphysicians to wait for another revolution of the cycle, to bring back the golden days when the disputes between the nominalists and realists were supposed to involve the fate of kings and empires. Sir Graves C. Haughton's book is but the herald of a larger work. A long and close investigation of the Sanscrit metaphysics, and the subtile speculations which occupied the sages on the banks of the Ganges, have disciplined his mind for exploring the mysterious workings of the intellect; and in his controversy with Col. Vans Kennedy on the Vedanta philosophy, he displayed a steadiness and fixedness of purpose in tracing the labyrinths in which the Hindoos have involved the great principle of scepticism, which must have afforded good grounds for the belief, that he would be a safe guide in original investigations. The present volume is designed to bring the principles of nominalism immediately to bear on language, the instrument of metaphysical investigations; and all who have a taste for such studies, will find his work replete with useful suggestions and varied illustrations. Mr. Field's work is designed to prove that the whole universe is composed of Triads—that there is not only a Trinity in Deity, but a Triunity in all his creatures, and in all that can engage their attention. He has hit upon some useful thoughts in his pursuits of this chimera, but the general theory appears to us a mere creature of the fancy.

Elements of Zoology, &c., by W. Rhind, Edinburgh.—A class book for junior students, illustrating in their simplest form, the doctrines and facts which concern life and organization in the various gradations of animal existence. We ever accept, with pleasure, works of this description, if executed with distinctness and fidelity. It must be long before a knowledge of this most important branch of public instruction will be adequately diffused; for independently of the information Zoology conveys, concerning facts bearing upon the ordinary business of life, it must add largely to the sum of human happiness as a source of amusement, while it serves as an excellent text for inculcating the great dogma of peace on earth and good-will towards men. Mr. Rhind's little work will be found a useful present to young people who have leisure and inclination for inquiry.

Pryce on Native Education in India.—Dr. Pryce gives a very pleasing and satisfactory account of the exertions made by the Church of Scotland to diffuse civilization and Christianity among the natives of India. He points out the errors to which missionaries are most exposed, and suggests that indirect teaching is far more likely to prove useful than direct attacks upon Mohammedanism and idolatry. He discusses the religious state of the Hindoos in a liberal and enlightened spirit; but we regret to add, that in speaking of his brother Christians he displays too much of sectarian rancour.

Fire-side Education, by S. G. Goodrich.—The author of Peter Parley's tales has given sufficient proof of his accurate knowledge of the juvenile mind to entitle his suggestions respecting domestic education to our best attention: yet, with all our respect for his talents and his judgment, we cannot but feel that in this work he has been too often led away by a love of fine writing, and has been apparently anxious to say old things in a new form. Mixed up with much that is no better than disguised common place, we find many useful rules and valuable directions; we should indeed be glad to see the work judiciously remoulded and accommodated to the state of society in England.

On the Enlisting, Discharging, and Pensioning of Soldiers, &c. &c., by H. Marshall, F.R.S.E, Deputy Inspector-General of Army Hospitals.—This is a work, which, both for its matter and execution, will be eagerly read by the army medical men; and we think that it will likewise repay the trouble of perusal in a yet wider circle. In its exhibition of the struggle, which goes on in the army between the regimental surgeon and medical boards on the one hand, and the soldier on the other, there is much amusing anecdote, and some illustration of human nature under a singular aspect: as Sir Archy would say, this part of the work is "as gude as a comedy." Another striking feature is the contribution of statistical fact, which is always curious and often important. We cannot dwell on the subject, but may make an extract or two:—During the last three years and five months of the Peninsular war, the period when the greatest activity prevailed, the mean strength of the British army amounted to 61,511 men, and the sick to 13,815, being 22¼ per cent. There is perhaps little doubt that a large portion of the inefficient troops were unfit, in consequence of inadequate physical strength, more than from actual sickness. The mean ratio of inefficiency from wounds did not exceed 1¾ per cent." This is a very unexpected result, and exhibits, in a strong light, the importance of a proper selection of subjects for the army, both as a matter of common humanity and of pecuniary expenditure. What an idea of the hardship of military life

and of the horrors of war is contained in the following!—"An extremely small proportion of the men belonging to infantry corps of the line exceed 40 years of age, I believe about 5 per cent. By the time they reach that age they have nearly all become unfit for active service, and require to be discharged on account of disabilities." In conclusion we have only to note, that the increasing attention to details of army service, like those which form the subject of this valuable volume, is a consolitary proof of an advance in civilization, in a quarter where formerly it has been little looked for.

Autumn Tourists.—Of these there is no chance of a decrease so long as Europe is at peace and railroads flourish. The great Atlantic steamers will hardly rob the Brunnens of one solitary bather, or our own lakes and Trosachs and Clachans of a single solitary pilgrim. The *Letters from Germany and Belgium*, which serve as the first clause of our text on the present occasion, do not, like their companions, aspire to the authority of guide-books: they are merely the easy and good-humoured journals of one, who, in the year 1836, passed the interval between July and October in rambling along the beaten track, noting what every one sees by the way; and their greater portion, as the preface tells us, has been already published in the periodicals. In their company stands a book far more distinct and peculiar in its character—*Three Months in the North; including excursions in Tellemark and Ringeringe, with an Itinerary*, by George Downes, &c., &c., &c.—A stranger little tome we have not often perused. The tourist is at once simple, shrewd, egotistic, given to the vice of florid description, and companioned, every step of his journey, by certain prevailing notions, which, however, to render him justice, are generous and philanthropical. From the time that he sets his foot on German ground in "rich and rampant Hamburgh" (to quote his own somewhat unintelligible epithets) till the time when he re-embarks for Dublin, from that "vulgar Venice" Rotterdam, the supreme good which he sees in everything is teetotalism: and he never loses an opportunity to ramble away from rocks, fiords, waterfalls, works of nature and works of art, for the discussion of some favourite scheme of ameliorating the morals of mankind, or to gossip concerning some brother's or sister's excellence, as light-hearted, as unworldly, and as zealous as himself. In short, Mr. Downes's book is, as the friend of Madame von Arnim (Goethe's Bettine) said of her diary, "a book for the good, not for the bad"—for the tolerant reader, and not for the mocker. To these may be added, a new edition, in one volume, of Dr. Granville's *Spas of Germany*, a work which we recommend to all about to visit those pleasant places, and which is not only improved by being compressed into one volume, but by the omission of some objectionable personalities. With these may be coupled some guide-books of a less literary character: *Black's Picturesque Tourist in Scotland*, and *Economical Guide through Edinburgh*, which are full of matter, sensibly written, and liberally illustrated with maps, plans, &c. &c. We have also a second edition of Claridge's *Guide down the Danube*, and a little waiscoat-pocket volume, called *The Hand-book to Paris*, which contains a good deal of useful observation: Onwhyn's *Guide to the Highlands* is another useful little work, but we must conclude with the *Matlock Tourist*, a shilling *Guide through the Peak*, by Henricus, who has done the whole wonders of that romantic district in the vein of Erelos.

List of New Books.—Memoranda of Richard Howard, Part III. "Letters," 12mo. cl. 2s., 3 parts, complete, 12mo. cl. 5s.—The Child's Guide to Knowledge, by a Lady, 9th edit. 18mo. hf-bd. 3s.—Porny's French Spelling, 12mo. new edit. 2s. sheep.—Molineaux on the Globes, 11th edit. 12mo. 3s. red sheep, lettered.—Ellis's Exercises, 16th edit. 12mo. 3s. 6d. bd.—Anacharsis Abrégé, 10th edit. 12mo. 6s. bd.—The Poetical Works and Translations of W. Cowper, edited by Cary, imperial 8vo. 14s. cl.—Lindley's Ladies' Botany Abridged, 12mo. cl. 12s.—Goethe's Faust, Part I. Translated into English Rhyme, by Hon. Robert Talbot, 2nd edit. 8vo. 18s. cl.—Carlyle's Miscellanies, 4 vols. post 8vo. cl. 2l. 2s.—Little Pedlington and the Pedlingtonians, by John Poole, Esq., 2 vols. post 8vo. 21s.—Pearson's Life of Swartz, 3rd edit. 2 vols. post 8vo. cl. 16s.—Life of the Rev. Henry Venn, 6th edit. fc. cl. 8s.—Wheatley on the Common Prayer, new edit. 8vo. cl. 8s.—Crabb's Dictionary of General Knowledge, new edit. 7s. cl.—Physical Theory of Another Life, 2nd edit. fc. cl. 6s.—Quarle's Emblems, new edit. 2 vols. in 1., 12mo. cl. 10s. 6d.—Elliott's Practical Treatise on the Qualification and Registration of Parliamentary Electors, 12mo. 10s. 6d.—Jethro: the Prize Essay on Lay Agency, royal 12mo. cl. 5s.—Our Country, being the Second Prize Essay on Lay Agency, 12mo. cl. 4s.—Thompson's Guide to the Study of the Pentateuch, 12mo. cl. 4s. 6d.—Turnbull's Sketches of Real Life, 12mo. cl. 5s.—Morton's Manual of Veterinary Pharmacy, 12mo. cl. 9s.—Shaw on Discoveries in the Nervous System, 8vo. cl. 5s.—Manual for Mechanics' Institutions, 12mo. cl. 5s.—Wilson's Stories about Horses, 2nd edit. square cl. 3s. 6d.—The Adventures of Ulysses, by Charles Lamb, fc. cl. 3s.—The Child's Library, 'Peter Wilkins,' 16mo. cl. 2s. 6d.—Whalley's Tithe Amendment Act, 2 & 3 Victoria, 12mo. swd. 2s. 6d.—Dewhurst on the Silk Worm, 2nd edit. 18mo. cl. 2s. 6d.—Channing on Self-Culture, 18mo. cl. 1s., sewed 6d.—Family Prayers for a Week, by C. M. P., 18mo. cl. 1s.—White's New Tithe Amendment Act, 12mo. swd. 2s.—Pastor's Gift to his Parish Families, fc. cl. 1s. 6d.—Hopkins's Vanity of the World, 18mo. cl. 1s. 6d.—Sherlock's Trial of the Witnesses, with Sequel, (Christian Library,) royal 8vo. swd. 1s. 2d.—Hand-Book of Conchology, 18mo. cl. 1s.—Guizot's Civilization, People's Edition, 8vo. swd. 1s. 4d.—Daily Refreshment, 64mo. cl. gilt, 8d.—Histoires des Animaux, 2nd edit. 16mo. cl. 2s. 6d.—Felton's Commercial Calculator, 12mo. sheep, 2s.—Rowbotham's Derivative Spelling-Book, 12mo. sheep, 2s.—Johnson's Every Lady her own Flower Gardener, 18mo. cl. 2s.—Holy Thoughts, or a Treasury of True Riches, 12mo. 3s. 6d. cl., 2s. silk.—The Times in which we Live, or the Sixth Vial, by the Rev. F. Fysh, 8vo. swd. 1s.

NINTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THURSDAY, AUGUST 29.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

The Secretary read the report of the Committee, consisting of Sir J. Herschel, Mr. Whewell, Mr. Peacock, and Prof. Lloyd, appointed to represent to Government the resolutions adopted by the Association in August 1838, at Newcastle, recommending that Magnetic Observatories be established in various parts of the British dominions, and that a naval expedition be fitted out for the purpose of determining, by observations, the magnetic direction and intensity, in high southern latitudes, between the meridians of New Holland and Cape Horn.

The successful result of the exertions of the Committee, and the admirable Report drawn out by the Royal Society, for the guidance and instruction of the officers engaged in the expedition, and which we so lately published (*Athen.* Nos. 616, 617), have so far anticipated the interest which would otherwise have attached to this paper, that we are reluctantly compelled, in the present crowded state of our columns, to pass it over.

'On certain Points in the Wave-Theory, as connected with Elliptic Polarization, &c.' by Prof. Powell.—The object of this communication is to lay before the Section a general statement of some material conditions which involve in a common relation the theory of dispersion, of the wave-surface, and of elliptic polarization. These have been the subject of some difference of opinion, and are still involved in considerable difficulty and apparent contradiction; a brief and clear statement of those points may, perhaps, tend to their better elucidation and ultimate solution. All the investigations set out from these equations of motion:—

$$(A)\quad \begin{cases} \dfrac{d^2\xi}{dt^2} = \Sigma \left\{ \phi(r)\,\Delta\xi \right. \\ \qquad \left. +\psi(r)\,\Delta x[\Delta x\Delta\xi + \Delta y\Delta\eta + \Delta z\Delta\zeta] \right. \\ \dfrac{d^2\eta}{dt^2} = \Sigma \left\{ \phi(r)\,\Delta\eta \right. \\ \qquad \left. +\psi(r)\,\Delta y[\quad\quad\quad\quad\quad\quad] \right. \\ \dfrac{d^2\zeta}{dt^2} = \Sigma \left\{ \phi(r)\,\Delta\zeta \right. \\ \qquad \left. +\psi(r)\,\Delta z[\quad\quad\quad\quad\quad\quad] \right. \end{cases}$$

By certain developements of $\Delta\xi$ $\Delta\eta$ $\Delta\zeta$, these forms involve as factors of products such as

$$\Sigma\,[\psi(r)\Delta x\ \Delta y]\ \&c.$$

If these sums are $=o$, the expressions are brought into forms in which they are directly integrable, and we have for solutions:—

$$\xi = \Sigma\,[\alpha \sin(nt - k\rho)$$
$$\eta = \Sigma\,[\beta \sin(nt - k\rho)$$
$$\zeta = \Sigma\,[\gamma \sin(nt - k\rho)$$

which are shown to involve such a relation between n and k, as gives the formula for the dispersion.

This condition, which I call (B), reduces the equations (A) to the form—

$$(C)\quad \begin{cases} \dfrac{d^2\xi}{dt^2} = \Sigma\left\{[\phi(r) + \psi(r)\Delta x^2]\Delta\xi\right\} \\ \&c. = \quad\quad \&c. \\ \&c. = \quad\quad \&c. \end{cases}$$

And it corresponds to the supposition that the molecules are so arranged with respect to the axes $x\ y\ z$, that the sums with opposite signs destroy each other. It is on this supposition alone that all the principal investigations proceed, from which the theory of dispersion is derived. And in all these investigations we consider a rectilinear displacement or vibration, which may be generally in any direction, and whose resolved parts in the direction of the three axes are $\xi\ \eta\ \zeta$ respectively. This may apply to all cases of unpolarized or plane-polarized light. But for elliptically (including circularly) polarized light, it is necessary to consider, not a rectilinear, but a curvilinear displacement or vibration, which is the result of *two* virtual rectilinear displacements acting at right angles to each other, and in a plane transverse to the direction of the ray, and one always in a phase retarded behind the other by an interval (b). In this case, therefore, it is necessary to proceed by making one of the co-ordinate axes (as x) coincide with the ray, and $\xi = o$, $\Delta\xi = o$, &c., while the other two in y and z coincide with the components, which give the elliptic vibration, and are of the forms—

$$\eta = \Sigma\,[a \sin(nt - kx)\quad]$$
$$\zeta = \Sigma\,[\beta \sin(nt - kx + b)]$$

This case, I believe, was first considered by Mr. Tovey. Pursuing the investigation thus, taking the axes generally as in any direction whatever, with respect to the arrangement of the molecules, it appears from Mr. Tovey's paper, ('Journal of Science,' No. 71,) and from the somewhat simplified form in mine ('Phil. Trans.' 1838, part 2,) that in the case of elliptic polarization, the condition (B) cannot hold good; while for common or plane polarized light it must hold good. The distinction, therefore, between the different states of light as to polarization, depends on this characteristic or criterion, which I call (E). The discussion between Mr. Tovey and Mr. Lubbock ('L. & E. Phil. Mag.' Dec. 1837, Jan. 1838,) seems to turn upon these propositions:—1. That every system of molecules (constituted as supposed in all these investigations) has at every point three axes of elasticity, whatever be the peculiar arrangement of the molecules. 2. That if we take these axes for the axes of co-ordinates, then the equations of motion are reduced to the form (C), or the condition (B) holds good. 3. This form of the equation is necessary for the investigation of the wave surface; or at least, so much so, that without it the deduction is immensely complicated. At all events, the universal existence of such axes is essential to the nature of the wave-surface. Now, since these considerations are essential to the application of the theory to all media, it follows that in all cases there are certain axes in reference to which the condition (B) holds good. This, then, appears at direct variance with the distinction established above, or the criterion (E). And if we set out with equations (C), and pursue a train of deduction similar to Mr. Tovey's or mine, we find corresponding formulæ, but from which the conclusions in question cannot be derived. It appears, then, essentially important, that this discrepancy should be cleared up, and the fallacy, if any, detected.

'On the Temperature of the Earth in the Deep Mines of Lancashire and Cheshire,' by Mr. Eaton Hodgkinson. These experiments were made with thermometers belonging to the Association, and in the prosecution of them the author has been very greatly assisted by the proprietors of pits and others connected with them, who have kindly undertaken to observe the results themselves—thus saving the author the trouble, in some cases, of going more than once into the mine. The object of the experiments was to forward the views of the Association—which were, to obtain, from observations made in various places, and at different depths, some additional knowledge of the internal temperature of the earth. In the salt mines of Messrs. Worthington and Firth, at Northwich, in Cheshire, latitude about 53° 15′, a thermometer placed in a bore hole, 3 feet deep in the rock, 112 yards below the surface, indicated a temperature of 51° to 51¼° Fah., and varied little or nothing between summer and winter. In the deep coal mines of Messrs. Leeses, Jones, & Booth, near Oldham, a thermometer, placed in a bore hole as before, 329¼ yards below the surface, varied from 57° to 58¼° Fah., from observations made for a whole year, by Mr. J. Swain. In the Haydock colliery, 201 yards deep, about eighteen miles west of Manchester, and differing from it but little in latitude, the temperature

varied considerably, both in the same hole and in different ones, but approached to 58°. The cause of these anomalies the author has not discovered. The experiments were made for him by Mr. William Fort. Other experiments are in progress. The latitude of Manchester is 53° 30′, and the mean temperature of the air there is 48° Fah., from Dr. Dalton's experiments.

Prof. Stevelly asked Mr. Hodgkinson, whether it was possible that water could have access to those parts in which his thermometers had been placed, particularly those placed in the stratum next under the coal, or the floor of the mine?—Mr. Hodgkinson thought not.—Prof. Stevelly said, that the reason why he inquired was, that there were certain kinds of coal, which, when exposed to the action of water developed much heat. This was the case with all coals which contain pyrites. The substance of which the floor of the mine was composed, though nearly as hard as a metal, had such an affinity for moisture that even the hygrometric moisture of the air would decompose it, and of course develope more or less heat.—Prof. Forbes said it had been clearly established that coal mines were improper localities for making observations on subterranean temperature.

The President said, that as the Report which was next on the list was nearly allied in subject to the one at present under consideration, it would perhaps be convenient to permit it to be read, and to discuss both at the same time.

'Report on Observations on the Temperature of the Earth at different depths, made near Edinburgh,' by Prof. Forbes.—These observations were commenced in Feb. 1837, and have been regularly continued since. They were instituted at the expense of the British Association; and the result of two years reductions was presented to the Section.* The object was to ascertain the conducting power for heat of different soils, and the measure of the sun's influence at different depths under similar *external* circumstances. The stations and soils were,

Observatory.	*Experimental Garden.*	*Craigleith.*
Trap Tufa.	Pure loose sand.	Compact coal-formation sandstone.

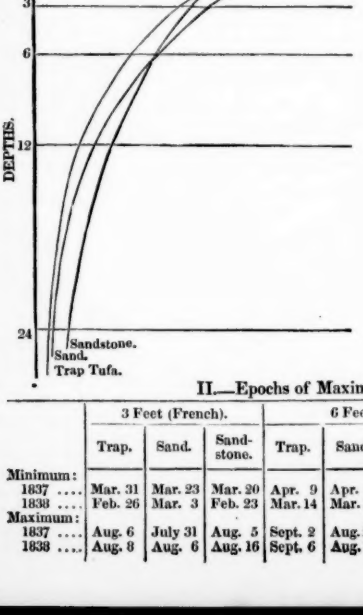
At each station four thermometers were sunk to the depths of 3, 6, 12, and 24 *French* feet respectively, the tubes of each being carried above the surface, so as to be conveniently exposed side by side. The readings were made every week, and corrected for the temperature of the stem and scale, and the results were projected in the form of curves, from which the following deductions have been made:—

I.—Annual Report.

	3 Feet (French).			6 Feet.			12 Feet.			24 Feet.		
	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.
1837. Fahr.	18.95	19.65	17.25	11.9	14.95	13.9	5.5	7.55	9.4	1.45	2.1	4.1
Cent.	10.53	11.23	9.58	6.61	8.30	7.72	3.05	4.19	5.22	0.80	1.16	2.28
1838. Fahr.	17.7	20.33	18.52	11.2	14.57	14.25	5.05	7.1	9.3	1.25	1.88	3.83
Cent.	9.83	11.30	10.29	6.22	8.10	7 91	2.80	3.94	5.16	0.70	1.05	2.13

These numbers involve the data for computing the Conductivity of these several strata; for the range in each case is found (as theory indicates) to diminish in geometrical progression, as the depths increase arithmetically, and the common ratio of the progression depends on the value of $\sqrt{\frac{\text{Specific heat}}{\text{Conductivity}}}$, which is the value of B in the following formula $\Delta_p = A + Bp$.

Where Δ_p is the range, and p the depth from the surface. To obtain the value of B, the above ranges were projected, and logarithmic curves drawn through the points, so as to satisfy approximately the observations at each station; the result is shown for the year 1838 in the subjoined figure, from which it will be seen that the experiments are perfectly consistent with one another, although (as at first sight might be expected) the amount of the range does not follow the same order of magnitude in the three soils at different depths.



The values of B, thus deduced, are—

	Trap.	Sand.	Sandstone.
In 1837.....	—.0545	—.0440	—.0316
In 1838.....	—.0641	—.0517	—.0345

The difference of these numbers, such as it is, is evidently not attributable either to errors of observation or to the inadequacy of the experiment to afford consistent results; a comparison of the curves for two years, in which every observation is projected, shows the most minute general conformity in their flexures and intersections. It is rather probably to be attributed to the observations having been commenced too late in the winter of 1836-7 to obtain the true minimum for that period, from which circumstance the superficial range would come out too small, and B would therefore be diminished, as it is in each of the three cases.

From the observations of 1838 we deduce farther this important result, that the oscillations of annual temperature would be reduced to $\frac{1}{100}$ of a Centigrade degree (or virtually extinguished) at a depth of

49 feet in trap tufa.
62 feet in incoherent sand.
91 feet in compact sandstone.

The differences in the value of B determined by various observers (varying in the results quoted by M. Quetelet in his excellent memoir on this subject, from —.0526 to —.0384) do not depend upon difference of geographical position, but on the various constitutions of the soil operated upon, a circumstance hitherto wholly neglected.

* Some account of the first year's experiments has already been presented to the Royal Society of Edinburgh, and printed in their Proceedings.

II.—Epochs of Maximum and Minimum Temperature.

	3 Feet (French).			6 Feet.			12 Feet.			24 Feet.		
	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.	Trap.	Sand.	Sand-stone.
Minimum:												
1837	Mar. 31	Mar. 23	Mar. 20	Apr. 9	Apr. 5	Mar. 26	May 6	Apr. 30	Apr. 10	July 26	July 12	May 18
1838	Feb. 26	Mar. 3	Feb. 23	Mar. 14	Mar. 19	Mar. 3	Apr. 20	Apr. 22	Mar. 20	July 18	July 8	May 12
Maximum:												
1837	Aug. 6	July 31	Aug. 5	Sept. 2	Aug. 24	Aug. 19	Oct. 17	Oct. 6	Sept. 11	Jan. 8	Dec. 30	Nov. 11
1838	Aug. 8	Aug. 6	Aug. 16	Sept. 6	Aug. 31	Aug. 23	Oct. 19	Oct. 14	Sept. 19	Jan. 5	Jan. 4	Nov. 2

These dates, derived by graphical interpolation, are only approximate.

The progressive retardation of epochs as we descend is too evident to require to be pointed out. The maximum occurs 5½ months after that of the air in the two first-named strata, whilst the conducting power of the sandstone is so superior as to accelerate this epoch by seven or eight weeks, compared with the trap or loose sand. Were this result deduced from thermometers placed at one depth only, its exactness might be doubted. It is derived, however, also from the intermediate ones.

By a simple graphical method it is easy to deduce approximately the *rate of propagation* of heat downwards in each of these soils, resulting from the whole observations taken together. The observations at different depths confirm one another; but the minimum in 1837 was, as already stated, too imperfectly observed for the upper thermometers to be of much service. The remaining observations afford the following results:—

Soil and Locality.	Time of propagation of heat through One foot (French), deduced from			
	Maximum, 1837.	Minimum, 1838.	Maximum, 1838.	Mean.
Trap (Observatory)	7.5 days	6.5 days	6.8 days	6.9 days.
Sand (Exp. Garden)	7.1 —	5.8 —	6.8 —	6.6 —
Sandstone (Craigleith)	4.9 —	3.6 —	3.6 —	4.0 —

These results confirm the relation of conducting powers indicated by the constant B already found; but the numerical comparison of these independent results is a matter of extreme complication—(see Poisson, *Théorie de la Chaleur*, chap. xii.)

The President congratulated the members on the results likely to flow from experiments conducted on so well-digested a system. Any person who was conversant with the writings of Fourier, and other foreign writers on this branch of mixed mathematics, must be aware how necessary it was to be in possession of a sufficient store of well-ascertained facts, on which any theory, if it be sound, must rest and be dependent. The facts now collected were almost as complete as could be expected or desired; that those are not merely accidental variations of temperature which are indicated, must be observed on the most superficial examination of the three curves. The general conformity, while the thermometers, of whose indications they were as it were the types, were placed at such distances and in substances differing so materially in structure and physical character, together with the reproduction of curves in successive years so coincident in their general characters, were circumstances tending to stamp with the character of truth the results, and to show the soundness of the system on which these researches had been conducted. Theory had long been in advance of practical knowledge on this subject, but practice was now coming up and beginning to take her proper place as the handmaid and sure assistant of theory. Heretofore, the scale upon which experiment had been performed on the conducting power of the several substances of which the crust of our earth is composed, were on so small a scale that the analyst scarcely knew whether he was safe in using their results. In every point of view, then, they were most important.—Mr. Snow Harris observed, that an inspection of these curves would lead to the conclusion that, as the depth increased, their curvature diminished, and that therefore at some certain depth they would turn into straight lines, and the temperature at that depth become constant.—Prof. Forbes said that not only did this appear obviously from an inspection of the curves, but also the formulæ which he had investigated and placed on the board indicated it.

'On the Progress of the Meteorological Observations at Plymouth, with the Barometer and Thermometer,' by Mr. Snow Harris.—The pressure of our atmosphere, as indicated by the barometer, being affected in these latitudes by many accidental circumstances, it is not without difficulty we are enabled to trace the great periodical variations, and exhibit them as they would appear in an undisturbed state. It is only by a careful and extensive series of observations, such as those now in progress in various places under the direction of the British Association,

that we can hope to examine successively great periodical variations in atmospheric pressure, and bring them under the dominion of general laws. The great periodical variation, as shown by the horary oscillation, observed by Humboldt in the tropics, and by other philosophers in different parts of Europe, is undoubtedly a phenomenon of high interest in meteorology. In discussing the hourly observations with the barometer at Plymouth, Mr. Harris has shown that this phenomenon is distinctly traceable amidst a vast mass of accidental fluctuation. He exhibited the mean hourly pressures for the years 1837 and 1838, and the mean of the two years, and showed that a double wave was apparent, when these points were connected by a continuous line. The points in the waving line thus produced had been each determined from 730 observations; the whole number of observations from which the mean pressure had been deduced being 17,500. The following general results were then mentioned:—The mean height of the barometer at the Plymouth dockyard, 60 feet above the level of the sea, and at a mean temperature of 60° of Fahrenheit's scale, was from the latest results 29.8967. It occurred in the mean hourly progression four times in the day, viz. at 2, 20, and 8, 10, A.M.; 12, 30, and 6, 15, P.M.,—at which times the waves crossed the mean pressure line. The difference on oscillation from 5 to 10 A.M. amounted to .0113 of an inch, between 10 A.M. and 3, 30, P.M. amounted to .0118. The hours of greatest pressure were 10 A.M. and 9 P.M. The hours of least pressure, 5 A.M. and 3 P.M. Of the diurnal semi-waves, the ascent in the morning is the least, and the ascent in the evening the greatest. Of the descending branches of the curves, that during the day is less than that during the night. The times of the oscillations differ. The wave by day, viz. that between 5 A.M. and 3, 30, P.M. being ten hours and a half. That by night, viz. between 3, 30, and 5 A.M. being thirteen hours and a half. The size of the daily wave, therefore, so far as the observations hitherto proceeded, was less than that of the wave at night. Mr. Harris proceeded then to discuss the observations as applied to the different seasons, of spring, summer, autumn, and winter, and showed that the general hourly progress of the pressure was greatly interfered with at particular periods; the wave of autumn being that which coincided most nearly with the general curve. Of the different monthly pressures, October and December were the greatest, November and February the least, January and September the two nearest the mean.

Mr. Harris now proceeded to discuss the supposed Influence of the Moon on the Barometer, and with this view had reduced about 4,000 of the observations, so as to show the pressure at the time of the moon's southing, and for each hour before and after; but he could not discover any differences which could be supposed to arise from the moon's influence. He was therefore disposed to agree with the conclusion lately arrived at by Mr. Lubbock, from a discussion of the Barometric Observations at the Royal Society—viz. that no lunar irregularity is observable from this method of discussing the observations—that, if at any time established, it must prove extremely small. He could not, however, avoid mentioning, as a singular coincidence in the results of the two years, that taking the mean pressures about the four periods of the lunar changes, it appeared that the pressure was less at the new moon, and that it increased up to the last quarter, when it was the greatest. The first object being to arrive at certain great periodical variations, those had been principally kept in view; hence, mere accidental disturbances remained as yet unconsidered. Mr. Harris, however, had observed, as a very general result, that when the pressure decreased at night, whilst the temperature increased, the succeeding weather was always disturbed and uncertain—in winter, gales of wind from the S.E. and S.W., with rain; whilst, on the contrary, a decreasing temperature, with an increasing pressure, was generally followed by fair weather, with winds varying from N.W. to N.E. The observations hitherto made with the dry and wet bulb thermometer had not yet been reduced. Of the ordinary thermometer, more than 50,000 hourly observations were now completed. Mr. Harris had received two very interesting communications on the Hourly Changes of Temperature, which enabled him to contrast the curves of Plymouth and Leith with those of Frankfort Arsenal, near Philadelphia, and three places in Ceylon. The Association was indebted to Major Ord, R.E., for the latter, and to Capt. Mordecai, of the United States' Corps of Ordnance, for the former. Hourly observations had been obtained by these gentlemen, similar to those which had already appeared in the Transactions of the Association, and which fully confirmed the results arrived at by Sir D. Brewster, to whom the scientific world is indebted for the first perfect series of hourly observations of the thermometer, and also the results of those arrived at by Mr. Harris in the discussion of similar observations carried on at Plymouth, at the request of the Association. Mr. Harris here exhibited, under the form of curves, the mean hourly progress of the temperature at these different places. It appeared, from these observations, that the line of mean temperature at the three stations in Ceylon, between 6° and 8° N. lat., was crossed between 9 and 10 A.M., and at 9 P.M. The mean temperature at these stations being 74° at Kandy, and from 80° to 81° of Fahrenheit at the others, which did not materially differ from the times at Leith, in which the mean temperature is 48°, and the lat. about 55° N. At the Frankfort Arsenal, the line of mean temperature is crossed also about 10 A.M., but differed at night, being between 7 and 8 P.M.; whilst at Plymouth, the line of mean temperature was crossed soon after 8 A.M. and 7 P.M., by the latest observations. The little comparative mean range of the thermometer at Leith and Kandy, and in Ceylon, gave great similarity to the curves indicating the march of the hourly temperature in these places.—The author concluded with some general remarks on this subject.

Prof. Forbes and Prof. Whewell pointed out the necessity of reducing the observations to 32° of Fah.—Mr. Harris stated, that the temperatures at which the observations were made had not greatly differed, but that, before the Report appeared, the observations should be revised and reduced.

'On a New Calorimeter, by which the Heat disengaged in Combustion may be exactly measured, with some Introductory Remarks upon the Nature of different Coals,' by Andrew Ure, M.D.—In these researches, which are still in progress, the first point (said Dr. Ure) which I seek to ascertain is the proportion of volatile and fixed matter afforded by any kind of fuel—as, for example, pit-coal—when a given weight of it is subjected, in a retort or covered crucible, to a bright red heat. The result of this experiment shows how far the coal is a flaming or gas coal, and what quantity of coke it can produce. The second preliminary point of importance which I determine with regard to coals, is the amount of sulphur they may contain: a circumstance which has not hitherto been made the subject of precise investigation, in this country at least, but which is of great consequence, not only as to their domestic use, but to their employment by the iron-master and the manufacturer of gas. That good iron cannot be made with a sulphureous coal, however carefully coked, has been proved in France by a very costly experience. In general, when a coal leaves 15 or 16 per cent. of ferruginous ashes, we may conclude with certainty that it contains sulphur in corresponding proportion; for this substance exists always, I believe, in pit-coal, in the form of pyrites, but often disseminated or combined, so as to be invisible, unless by microscopic means. The most ready and exact method of determining rigidly the quantity of sulphur in any compound, is to mix a given weight of it with a certain weight of carbonate of potassa, nitre, and common salt, each chemically pure, and to ignite the mixture in a platinum crucible. A whitish mass is obtained, in which all the sulphur has been converted into sulphate of potassa. By ascertaining, with nitrate of baryta, the amount of sulphuric acid present, that of sulphur becomes known. By such a process, applied to different samples of coals, sent to me for analysis, I obtained the following results:—

Gas coals	No. 1.	Sulphur in 100 parts 3.00
	2	3.90
	3	2.42
	4	3.90
	5	2.50
	6	5.20
	7	3.40
	8	3.50

Coals for puddling cast iron to be converted into steel:			
1,	hard foliated, or splent, sp. grav.	1.258	0.80
2,	ditto	1.290	0.96
3,	ditto	1.273	3.10
4,	cubical, and rather soft	1.267	0.80

The presence of much sulphur in a gas coal is a great evil, because it affords, in its decomposition, so much sulphuretted hydrogen, as requires an operose process of washing or purification, which impoverishes the gas, and impairs its illuminating power by the abstraction of its olefiant gas or carburetted hydrogen. Hence I found, in a specimen of coal gas, as generated in the retorts of one of the London gas companies, no less than 18 per cent. of olefiant gas; but in the same gas, after its purification from sulphur, I found only 11 per cent. With a coal, such as No. 4 of the second series given above, at least 10 per cent. of the light might be economized. The apparatus which I employ consists of a large copper bath, capable of holding 100 gallons of water: it is traversed, forwards and backwards, four times, in four different levels, by a zig-zag horizontal flue, or flat pipe, nine inches broad, and one inch deep, ending below in a round pipe, which passes through the bottom of the copper bath, and receives there into it the top of a small black lead furnace. The interior furnace, which contains the fuel, is surrounded, at the distance of an inch, by another furnace, which case serves to prevent the dissipation of heat into the atmosphere. A pipe, from a pair of double-cylinder bellows, enters the ash-pit of the furnace at one side, and supplies a steady current of air to keep up the combustion, kindled at first by half an ounce of red-hot charcoal. So completely is the heat which is disengaged by the burning fuel absorbed by the water in the bath, that the air discharged at the top orifice has usually the same temperature as the atmosphere. In the experiments made with former water *calorimeters*, the combustion was maintained by the current of a chimney, open at bottom, which carried off at top a quantity of heat very difficult to estimate. My experiments have been directed hitherto chiefly to a comparison of the heating powers of Welsh anthracite, Llangennech, and a few other coals. I have found, that the anthracite, when burned in a peculiar way, with a certain small admixture of other coals, evolves a quantity of heat at least 35 per cent. greater than the Llangennech does, which latter is reckoned by many to be the best fuel for the purposes of steam navigation. One half pound of anthracite, burned with my apparatus, heats 600 pounds of water 10° Fahr., viz. from 62° to 72°, the temperature of the atmosphere being 66°; so that there is no fallacy occasioned either by the conducting powers of the surrounding medium, or by a chimney current. We thus see that one pound of anthracite will communicate, to at least 12,000 times its weight of water, an elevation of temperature of 1°, by Fahrenheit's scale. For the sake of brevity, we may call this quantity, or energy, 12,000 unities of heat. One pound of Llangennech, in the same circumstances, will afford 9,000 unities: one pound of good charcoal, after ordinary exposure to the air, affords 10,500: perfectly anhydrous charcoal would yield much more: one pound of Lambton's Wall's-end coals affords 7,500 unities. It deserves to be remarked, that a coal, which produces in its ignition much carburetted hydrogen and water, does not afford so much heat as a coal equally rich in carbon, but of a less hydrogenated nature, because, towards the production of the carburetted hydrogen and water a great deal of latent or specific heat is required: indeed, the evaporation of unburnt volatile matter from ordinary flaming coals abstracts unprofitably a very large portion of their heat, which they would otherwise afford. Hence, those chemists who, with M. Berthier and Mr. Richardson, estimate the calorific powers of coals by the quantity of carbon which they contain, or the quantity of oxygen which they consume, have arrived at very erroneous conclusions. The amount of error may be detected by experiments on the cokes of flaming coals. M. Berthier examines coals for their proportion of carbon, by igniting a mixture of each, finely pulverized, with litharge, in a crucible, and estimates 1 part of carbon for every 34 parts of lead which is reduced. I have made many researches in this way with both charcoal and anthracite, and have obtained very discordant results. In one experiment, 10 grains of pulverized anthracite, from

Merthyr Tydfil, mixed with 500 grains of pure litharge, afforded 380 grains of metallic lead; in a second similar experiment, 10 grains of the very same anthracite afforded 450 grains of lead; in a third, 350 grains. In one experiment with good ordinary charcoal, fresh calcined, 10 grains, mixed with 1,000 of litharge, afforded no less than 603 grains of metal. The crucible was, in each case, covered and luted. My future researches, which are intended to embrace every important variety of fuel, natural and artificial, will be made with an apparatus somewhat modified from that here described. Three furnaces will be inclosed within each other, with a stratum of air or ground charcoal between each, so as to prevent all loss of heat into the atmosphere, and thereby to transfer the whole heat disengaged by combustion into a large body of water, of a temperature so much below that of the atmosphere at the beginning of the experiment, as it shall be above it at the conclusion.

'On a method of filling a Barometer without the aid of an Air-pump, and of obtaining an invariable level of the surface of the Mercury in the cistern,' by Prof. Stevelly.—Prof. Stevelly said that it was very difficult to fill a barometer tube so as to be quite free from air and moisture. Mr. Daniell, in his Meteorological Essays, proposed to fill the barometer under the exhausted receiver of the air-pump, and actually had the barometer of the Royal Society so filled by Mr. Newman, under his own superintendence; but, although an expert London working optician might be found capable of executing successfully such a tube, yet few in the country could hope for such an advantage; and, in fact, although he had attempted the process at Belfast, he had never succeeded. After some consideration, the following simple mode of using the torrecellian vacuum of the tube itself, instead of the air-pump, in filling it, occurred to him. He heated the mercury as hot as it could be used, and filled the tube, in the common way, to within half an inch of the top; then worked out, in the usual way, all air bubbles, as perfectly as possible; filled up the tube to the top, and inverted it in a cup of hot mercury, when it, of course, subsided, in the upper part of the tube, to the barometric height; he then placed his finger on the mouth of the tube, under the mercury in the cup, and lifted it out; and, still holding his finger tightly over the mouth of the tube, laid it flat on a table, when the mercury in the tube soon lay at the under side of the tube, leaving the upper part along the length of the tube void. Upon then turning the tube slowly round, still keeping the finger on its mouth, every spark of air was gathered up. He then placed the tube in an upright position, with its mouth upwards, and, placing a funnel of clean dry paper about the upper part, an assistant filled the funnel slowly with hot mercury, so as to cover the fingers. Upon slowly withdrawing the finger, the mercury went gently in, and displaced almost perfectly the atmospheric air which had gathered into the void space. By renewing the process which succeeded the previous washing of the air out of the tube, once, or at most twice, a column of the most perfect brilliancy was obtained. He had mentioned this simple method to Dr. Robinson, of Armagh, who suggested that, to get rid of the damp and greasiness of the finger, it would be better to cover the mouth during the process with clean and dry caoutchouc; and this was found a decided advantage. The method of procuring an invariable surface in the cistern was equally simple. From the imperfection of his sight, it was an object of much interest to him to have as few readings or adjustments depending on sight as possible. He proposed, therefore, to divide the cistern into two compartments, by a diaphragm of sheet iron or glass, brought to a sharp edge at top. Into one of these compartments, the barometer tube dips; in the other is placed a plunger of glass or cast iron, which can be raised or lowered by a slow screw movement. To prepare for an observation, the plunger is first screwed down, by which it displaces the mercury in one compartment, and raises its surface in the other above the edge of the diaphragm; upon raising it slowly again, the mercury drains off to the level of the edge of the diaphragm, thus, at every observation, reducing the surface to a fixed level.

Section B.—Chemistry and Mineralogy.

Thursday.

'Notice of some Experiments upon a new Compound, called Iodosulphuric Acid, upon the true constitution of Chlorochromic Acid, and upon Chromamide,' by Mr. Lyon Playfair.—The object which I proposed to attain (said the writer) in commencing these experiments, was to discover some mode of isolating hyposulphurous acid. The experiments are still unfinished, but I will here notice the results already obtained. The best method of studying this subject appeared to be, to examine the characters of those compounds which have an analogous constitution. Chlorochromic acid, according to MM. Walter and Regnault, may be viewed as a compound of a hypothetical radical, "chromous acid," united with an atom of chlorine. If hyposulphurous acid also be considered as a combination of sulphurous acid with sulphur, both of these acids would belong to the same class. But as the opinions of chemists are much divided respecting the true rational composition of chlorochromic acid, Mr. Playfair was anxious to ascertain which view was the most correct. For this purpose, the behaviour of the solid compound of chlorochromic acid and ammonia was examined. By various tests applied to it, it did not appear to contain chromic acid. Now, if chlorochromic acid be really a salt, the bichromate of the perchloride of chromium, it ought to contain chromic acid; in short, it seems to be a peculiar compound, chromamide united with muriate of ammonia, and analogous to the sulphamide of Regnault. Chlorosulphuric acid is a compound which did not suit my purpose, on account of its never being obtained free from a foreign substance—the *liquor* of the Dutch chemists. It therefore became necessary to discover a substance of an analogous constitution, and which might be obtained with more ease, and with more purity. For this purpose, two equivalents of iodine were mixed with one of sulphite of lead, and the mixture was subjected to distillation: a dark red fluid passed over. This method, however, does not yield it of sufficient purity, being contaminated with iodine, which it retains in solution. A better method, therefore, consists in dissolving iodine in pyroxylic spirit, and sending a steam of sulphuric acid through the solution until it be completely saturated. By evaporation, distillation, and allowing the substance thus procured to remain over sulphuric acid, it may be obtained in a state of absolute purity; its taste is extremely acid, and when it is dropped upon the cuticle, a disagreeable obstinate sore is occasioned. I hoped that hyposulphurous acid might be isolated in a similar manner, and, upon trying the experiment, with the substitution of sulphur for iodine, a yellow liquid of an acid taste, distilled over; but it speedily decomposed with the deposition of sulphur. A sufficient quantity was not obtained for analytical investigation. There are many other modes suggested by the properties of iodosulphuric acid, some of which I hope may succeed. I have merely stated the method of obtaining iodosulphuric acid, but the same process is applicable to many others of a similar class, whose properties I am at present investigating. The circumstances which led me to enter into these experiments, were to remove the objections which the opponents of isomorphism have urged against that theory, on account of the great dissimilarity, both in chemical and in physical characters, which exists between the chromates and their corresponding sulphates. By boiling a sulphate of the oxide required with chromate of barytes, soluble salts may be obtained, isomorphous with the sulphates, and, in general, affecting the same number of atoms of water. The insoluble chromates, generally described in systematic treatises on chemistry as neutral chromates, are of a very interesting constitution, but their analytical developement is extremely intricate, from the fact of there being several of each oxide. There are many other points connected with this subject, with which I cannot detain you.

'A new theory of the Galvanization of Metals,' by Prof. Schönbein, of Basle.—The Professor began by stating, that the discovery of the chemical power of the voltaic pile, made in the beginning of the present century by British philosophers, drew the attention of the scientific world to the relations which exist between chemical and electrical phenomena; indeed, only a few years after this important fact had been ascertained, Sir Humphry Davy and Berzelius did not hesitate to establish the theory which has since been generally adopted—viz. that chemical and electrical forces are essentially the same. Prof. Schönbein considers, that the results of recent experiments are opposed to the theory. The facts which he brings forward in opposition to it are as follows:—1. A piece of iron was voltaically associated with a piece of zinc, and each of these metals was put into a separate vessel, filled with common water. The vessels did not communicate with each other. In the course of a few hours after the immersion of the iron, light flakes of oxide of iron made their appearance round the metal, and, after a couple of days, the latter was corroded to a considerable degree. The same result was obtained when the iron was plunged into water, and the zinc made to rise above the level of the fluid, so as to prevent the latter from being in the least contact with water. According to Prof. Schönbein, a piece of iron, when immersed in water without any voltaic association, was as much corroded as under the circumstances detailed. 2. Two pieces of iron were made, one of them the positive, the other the negative pole of a voltaic pile, which consisted of ten pairs of copper and zinc, and was charged with water holding 5 per cent. of common salt in solution. Each of the polar wires was put into a separate vessel, filled with common water. Under these circumcumstances, both wires were equally attacked and corroded in the same manner as if a single piece of iron had been put into water, for, after the lapse of a couple of hours, the polar wires were seen to be surrounded by light flakes of oxide of iron. 3. A piece of iron being voltaically associated with zinc, was exposed to the action of the atmosphere. Having left this voltaic pair for some time to itself, the iron part of it appeared to be covered with a thin layer of rust, and, on comparing it with a piece of iron which had also been placed within the atmosphere during the same space of time, no evident difference could be detected between the states of the surfaces of both pieces. 4. A piece of iron wire was connected with each of the poles of a voltaic pile, without making the wires touch each other. Being exposed to the action of the atmosphere under these circumstances, both polar wires appeared, after some time, equally affected by rust, and as much as another piece of iron which was not connected with a pile. 5. A piece of iron, being voltaically associated with zinc, was placed in common water, so that both metals were deposited in the same vessel. Although this voltaic pair has been kept in water for twelve months, the iron part of it does not appear to be in the least degree oxidized, its surface being perfectly brilliant. 6. A piece of iron wire was connected with each of the poles of a pile, and each of these pieces made to plunge into a separate vessel filled with common water, the vessels being connected by means of a piece of platinum. That portion of the negative polar wire which was immersed in the water did not rust at all, as long as there was a current passing through the arrangement. 7. Copper being intimately associated with zinc, and brought into an aqueous solution of chloride of sodium (in such a manner that each of the metals was plunged into a separate vessel), was soon chemically affected,—provided that the vessels did not communicate with each other. 8. The same experiment was made as in the preceding case, with the difference, however, that both metals were plunged into the same vessel. Under these circumstances, the copper piece was not in the least corroded by the salt water, whatever the length of time was during which the metals were immersed. 9. A piece of copper was connected with each of the poles of a voltaic pile, and put into a vessel containing an aqueous solution of common salt. Both pieces were attacked by the fluid just in the same way as if they had not been attached to a voltaic arrangement, provided the vessels did not communicate with each other. 10. The experiment was made as in the preceding case, with the difference only, that the vessels were made to communicate with each other by means of a piece of platinum. The positive polar wire quickly underwent oxidation, while the negative one remained untouched. If an aqueous solution of common salt was made use of as the exciting fluid in the pile, and the latter left unclosed, the copper pieces of the voltaic pair rather readily entered into oxidation, while they were not all chemically affected

when the pile was closed. 11. A piece either of copper or of iron was connected with each of the poles of a pile; two tumblers were filled, partly with mercury, partly with water, or with a solution of common salt, and the vessels made to communicate with each other by platinum, so as to make each extremity of the latter enter into the mercury of either vessel. Things having been arranged in the manner described, the polar wires were each introduced into one of the tumblers, so that the free end of each wire was made to plunge into the mercury. Under these circumstances, both polar wires appeared to be equally affected—that is, they were precisely in the circumstances as if they had not been connected with any voltaic arrangement. From these facts, Prof. Schönbein infers—1st, That neither common nor voltaic electricity is capable of changing the chemical bearings of any body, and that the principles of the electro-chemical theory, as laid down by Davy and Berzelius, are fallacious. 2nd, The change which certain metallic bodies, when placed under the influence of a current, seem to undergo with regard to their chemical relations, is due to the production of some substance or other, and its deposition upon those bodies by the agency of a current of electricity. 3rd, The condition, *sine quâ non*, for efficaciously protecting readily-oxidizable metals against the action of free oxygen dissolved in fluids, is, to arrange a closed voltaic circle, which is made up, on one side, of the metal to be protected, and another metallic body more readily oxidizable than the former, and, on the other side, of an electrolyte containing hydrogen, as water.

Prof. Shepard, of the Medical College, South Carolina, gave an account of the analysis of a meteorite, in which he had detected chlorine and silicon.

'On the Composition of Idocrase,' by Mr. T. Richardson.—The composition of the Silicates has attracted a considerable share of the attention of chemists, but until the discovery of the doctrine of Isomorphism, this department of mineralogy might be said to have remained stationary. It is however remarkable, that, even with the advantages of this beautiful law, many of the formulæ of minerals are very incorrect representations of their constitution, as, for example, in the received formula of Petalite, there is a difference of six per cent. of silica between the result of the analysis and that computed; and this is only one among many instances which might be adduced. Idocrase is even in a worse state than this, for Berzelius says, (Die Anwendung des Löthrohres, p. 218,) that the formula is not known with certainty, although Prof. Johnstone, in his report on Dimorphous Bodies, has assigned to it the following formula in common with the Garnet—viz.

$$\dot{\underset{3}{\dot{\text{Ca}}}}\,\ddot{\text{Si}} + \left.\begin{matrix}\dddot{\text{Al}}\\ \dddot{\text{Fe}}\end{matrix}\right\}\,\dddot{\text{Si}}$$

The subject has moreover been lately involved in greater obscurity, by the publication of M. Ivanoe's analysis in Poggendorff's Annalen, which differs from all the analyses hitherto made. With the view then of assisting in explaining these discrepancies, I have made the following analyses of Idocrase from different localities, with specimens selected from the cabinet of Mr. Hutton, of Newcastle-on-Tyne. It is needless to give the detail of the analyses, which were made with every care:—No. 1. was a specimen of Idocrase from Egg, in Norway; 2. Idocrase from Slatoush, in Siberia; 3. Idocrase from Piedmont; 4. Vesuvian from Monte Somma: 5. Egerane from Eger, in Bohemia.

	1	2	3	4	5
Silica	38.75	37.45	39.25	37.90	38.40
Alumina	17.35	18.85	17.30	18.10	18.15
Protox. Iron	8.10	7.75	7.62	4.89	7.40
Protox. Manganese	,,	trace	3.50	,,	trace
Lime	33.60	35.25	32.25	34.69	33.09
Magnesia	1.50	1.35	.47	3.23	3.02
	99.30	100.35	100.30	98.96	100.06

The result of all these analyses is, that the composition of Idocrase may be represented by the formula,

$$7\,(\text{FO, MO, CaO MgO})_3\,\text{SiO}_3 + 5\,\text{Al}_2\,\text{O}_3\,\text{SiO}_3$$

which may also be referred back to the fundamental formula of the Garnet, $3\,\text{RO, SiO}_3 + \text{R}_2\,\text{O}_3\,\text{SiO}_3$. This result however suggests the idea, that by attending more to the exact representation of the analytical results in the formula, some new light may possibly be thrown on some points in Isomorphism.

'Experiments on Fermentation,' with some general remarks, by Dr. Ure.*—A dispute having taken place between some distillers in Ireland, and officers of Excise, concerning the formation of alcohol in the vats or tuns by spontaneous fermentation, without the presence of yeast, the Commissioners of Excise thought fit to cause a series of experiments to be made upon the subject, and they were placed under my general superintendence. An experiment was made on the 6th of October, 1837, with the following mixture of corn.

2 Bushels of Barley weighing ..	100lb.	5 oz.
½ Bushel of Malt	21	7
½ Bushel of Oats	20	12
Total, 3 Bushels, weighing	142	8

The bruised corn was wetted with 26 gallons of water at the temperature of 160° F., and, after proper stirring, had 8 gallons more of water added to it at the average temperature of 194°. The mash was again well stirred, and at the end of 45 minutes the whole was covered up, having at that time a temperature of 138° F. Three hours afterwards, 16 gallons of wash only were drawn off; being considerably less than should have been obtained, had the apparatus been constructed somewhat differently, as shall be presently pointed out. The gravity of that wash was 1.060; or in the language of the distiller, 60 degrees. After a delay of two hours more, twenty additional gallons of water at the temperature of 200° were introduced, when the mash was well stirred, and then covered up for two hours, at which period 23 gallons of fine worts, of specific gravity 1.042, were drawn off. An hour afterwards 12 gallons of water at 200° were added to the residual grains, and in an hour and a half 11 gallons of wort, of the density 1.033, were obtained. Next morning the several worts were collected in a new mash tun. They consisted of 48 gallons at the temperature 80°, and of a specific gravity 2.0465, when reduced to 60°. Being set at 80°, fermentation soon commenced; in two days the specific gravity had fallen to 1.0317; in three days to 1.018; in four days to 1.013; and in five days to 1.012; the temperature having at last fallen to 78° F. The total attenuation was therefore 34½ degrees, indicating the production of 3.31 gallons of proof spirit; while the produce by distillation in low wines was 3.22; and by rectification in spirits and feints it was 3.05. The next experiment was commenced on the 12th of October, upon a similar mixture of corn to the preceding. 48 gallons of worts of 1.043 specific gravity were set at 82° in the tun, which next day was attenuated to 1.0418; in two days to 1.0202; in three days to 1.0125; and in five days to 1.0105; constituting in the whole an attenuation of 32½ degrees, which indicates the production of 3.12 gallons of proof spirits; while the produce of the first distillation was 2.93 in low wines; and that of the second in feints and spirits was 2.66. In these experiments, the wash when fermenting most actively, seemed to simmer and boil on the surface, with the emission of a hissing noise, and the copious evolution of carbonic acid gas. They prove beyond all doubt, that much alcohol may be generated in grain worts, without the addition of yeast, and that also at an early period; but the fermentation is never so active as with yeast, nor does it continue so long, or proceed to nearly the same degree of attenuation. I was never satisfied with the construction of the mash tun used in these experiments, and had accordingly suggested another form, by which the mash mixture could be maintained at the proper temperature during the mashing period. It is known to chemists, that the diastase of malt is the true saccharifying ferment which converts the fecula or starch of barley and other corn into sugar; but it acts beneficially only between the temperatures of 145° and 168° F.† When the temperature falls below the former number saccharification languishes, and when it rises much above the latter it is entirely checked. The new mash tun was made of sheet zinc, somewhat wider at bottom than top; it was placed in a wooden tun, so much larger, as to leave an interstitial space between the two of a couple of inches at the sides and bottom. Through this space a current of water at 160° was made to circulate slowly during the mashing period. Three bushels of malt, weighing 125lb. 3 oz., were wetted with 30 gallons of water at 167°, and the mixture being well agitated, the mash was left covered up at a temperature of 140° during three hours, when 19 gallons of fine worts were drawn off at the specific gravity of 1.0902, or 90.2 degrees. Twenty gallons more water at 167° were then added to the residuum, which afforded after two hours 28 gallons of wort at the gravity 1.036; 12 gallons of water at 167° were now poured on, which yielded after other two hours 15 gallons at the gravity 1.0185. Forty gallons of fine worts at 1.058 gravity, and 68° temperature, were collected in the evening of the same day, and let into the tun with 5 per cent. of yeast. The attenuation amounted in six days to 54 degrees. The third wort of this brewing, amounting to 15 gallons, being very feeble, was mixed with 7 gallons of the first and second worts, put into a copper, and concentrated by boiling to 11 gallons, which had a gravity of 1.058 at 60 F°. They were separately fermented with five per cent. of yeast, and suffered an attenuation of 48½ degrees. The produce of spirit from both, indicated by the attenuation was 5.36 gallons; the produce in low wines was actually 5.52, and that in spirits and feints was 5.33, being a perfect accordance with the Excise tables.

The next experiments were made with a view of determining at what elevation of temperature the activity or efficiency of yeast would be paralyzed, and how far the attenuation of worts could be pushed within six hours, which is the time limited by law for worts to be collected into the tun, from the time of beginning to run from the coolers. When worts of the gravity 1.0898 were set at 96° Fahr., with 5 per cent. of yeast, they attenuated 26.9° in 6 hours; worts of 1.0535 gravity set at 110° with 5 per cent. of yeast, attenuated 16° in about 5 hours; but when worts of 1.0533 were set, as above, at 120°, they neither fermented then, nor when allowed to cool; showing that the activity of the yeast was destroyed. When fresh yeast was now added to the last portion of worts, the attenuation became 5.8° in 2 hours, and 28.4° in 3 days; showing that the saccharine matter of the worts still retained its fermentative faculty. Malt worts being brewed as above specified, were set in the tun, one portion at a temperature of 70°, with a gravity of 1.0939, and 5 per cent. of yeast, which attenuated 66° in 3 days; other two portions of the same gravity were set at 120°, with about 10 per cent. of yeast, which underwent no fermentative change or attenuation in 6 hours, all the yeast having fallen to the bottom of the tuns. When these two samples of worts were allowed, however, to cool to from 74° to 72°, fermentation commenced, and produced in two days an attenuation of about 79°. It would appear, from these last two experiments, that yeast to the amount of 5 per cent. is so powerfully affected by strong worts heated to 120°, as to have its fermentative energy destroyed; but that when yeast is added to the amount of 10 per cent., the 5 parts of excess are not permanently decomposed, but have their activity merely suspended till the saccharine liquid falls to a temperature compatible with fermentation. Yeast, according to my observations, when viewed in a good achromatic microscope, consists altogether of translucent spherical and spheroidal particles, each of about the 6000th part of an inch in diameter. When the beer in which they float is washed away with a little water, they are seen to be colourless; their yellowish tint, when they are examined directly from the fermenting square or round of a porter brewery, being due to the infusion of the brown malt. The yeast of a square newly set seems to consist of particles smaller than those of older yeast, but the difference of size is not considerable. The researches of Schulze, Cagniard de la Tour, and Schwann, appear to show that the vinous fermentation, and the putrefaction of animal matters—processes which have been hitherto considered as belonging entirely to the domain of chemical affinity—are essentially the results of an organic developement of living beings. This position seems to be established by the following experiments:—1. A matrass or flask containing a few bits of flesh being filled up to one-

* From the pressure of business before the Section, Dr. Ure did not read this paper, but gave merely a summary of its contents.

† M. Raspail's observations upon diastase are entirely erroneous; and cannot be allowed to invalidate the facts adduced by Payen, Persoz, and Guerin Varry. In fact, were Raspail correct, wheat flour boiled with water should immediately form sugar.

third of its capacity with water, was closed with a cork, into which two slender glass tubes were cemented air-tight. Both of these tubes were passed externally through a metallic bath, kept constantly melted, at a temperature approaching to that of boiling mercury. The end of one of the tubes, on emerging from the bath, was placed in communication with a gasometer. The contents of the matrass were now made to boil briskly, so that the air contained in it and the glass tubes was expelled. The matrass being then allowed to cool, a current of atmospherical air was made constantly to pass through it from the gasometer, while the metallic bath was kept constantly hot enough to decompose the living particles in the air. In these experiments, which were many times repeated, no infusoria or fungi appeared, no putrefaction took place, the flesh underwent no change, and the liquor remained as clear as it was immediately after being boiled. As it was found very troublesome to maintain the metallic bath at the melting pitch, the following modification of the apparatus was adopted in the subsequent researches. A flask of three ounces capacity, being one-fourth filled with water and flesh, was closed with a tight cork, secured in its place by wire. Two glass tubes were passed through the cork; the one of them was bent down, and dipped at its end into a small capsule containing quicksilver, covered with a layer of oil; the other was bent on leaving the cork, first into a horizontal direction, and downwards for an inch and a half, afterwards into a pair of spiral turns, then upwards, lastly horizontal, whence it was drawn out to a point. The pores of the cork having been filled with caoutchouc varnish, the contents of the flask were boiled till steam issued copiously through both of the glass tubes, and the quicksilver and oil became as hot as boiling water. In order that no living particles could be generated in the water condensed beneath the oil, a few fragments of corrosive sublimate were laid upon the quicksilver. During the boiling, the flame of a spirit lamp was drawn up over the spiral part of the second glass tube, by means of a glass chimney placed over it, so as to soften the glass, while the further part of the tube was heated by another spirit lamp, to prevent its getting cracked by the condensation of the steam. After the ebullition had been kept up a quarter of an hour, the flask was allowed to cool and get filled with air, through the hot spiral of the second tube. When the contents were quite cold, the end of this tube was hermetically sealed, the part of it between the point and the spiral was heated strongly with the flames, and the lamps were then withdrawn. The matrass contained now nothing but boiled flesh and gently ignited air. The air was renewed occasionally through the second tube, its spiral part being first strongly heated, its point then broken off, and connected with a gasometer, which caused the air to pass onwards slowly, and escape at the end of the first tube immersed in the quicksilver. The end of the second tube was again hermetically closed, while the part interjacent between it and the spiral was exposed to the spirit flame. By means of these precautions, decoctions of flesh were preserved, during a period of six weeks, in a temperature of from 14° to 20° R. (63½° to 77° F.), without any appearance of putrefaction, infusoria, or mouldiness: on opening the vessel, however, the contents fermented in a few days, as if they had been boiled in the ordinary manner. In conducting such researches, the greatest pains must be taken to render the cork and junctions of the glass tubes perfectly air-tight. The following more convenient modification of the experiment, but one equally successful and demonstrative, was arranged by F. Schulze. The glass tubes connected with the flask, were furnished each with a bulb at a little distance from the cork; into one of which globes caustic alkaline lye being put, and into the other strong sulphuric acid, air was slowly sucked through the extremity of the one tube, while it entered at the other, so as to renew the atmosphere over the decoction of flesh in the flask. In another set of experiments, four flasks being filled with a solution of cane-sugar, containing some beer yeast, were corked, and plunged in boiling water till they acquired its temperature. They were then taken out, inverted in a mercurial bath, uncorked, and allowed to cool in that position. From one-third to one-fourth of their volume of atmospherical air was now introduced into each of the flasks; into two of them, through slender glass tubes kept red hot at a certain point, into the other two through glass tubes not heated. By analysis it was found that the air thus heated contained only 19.4 per cent. of oxygen, instead of 20.8; but, to compensate for this deficiency, a little more air was admitted into the two flasks connected with the heated tubes, than into the two others. The flasks were now corked and placed in an inverted position, in a temperature of from 10° to 14° R. (54½° to 63½° F.) After a period of from four to six weeks, it was found that fermentation had taken place in both of the flasks which contained the non-ignited air—for, in loosening the corks, some of the contents were projected with force—but, in the other two flasks, there was no appearance of fermentation, either then, or in double the time. As the extract of nux vomica is known to be a poison to *infusoria* (animalcules), but not to vegetating mould, while arsenic is a poison to both, by these tests it was proved that the living particles instrumental to fermentation belonged to the order of plants of the Confervoid family. Beer yeast, according to Schwann, consists entirely of microscopic fungi, in the shape of small oval grains of a yellowish white colour, arranged in rows oblique to each other. Fresh grape must contains none of them; but, after being exposed to the air at 20° R., for 36 hours, similar grains become visible in the microscope, and may be observed to grow larger in the course of an hour, or even in half that time. A few hours after these plants are first perceived, gas begins to be disengaged. They multiply greatly in the course of fermentation, and at its conclusion subside to the bottom of the beer in the shape of a yellow white powder.

Mr. Martineau objected to the low temperatures for making extracts mentioned by Dr. Ure.—Mr. Black, on being referred to by Dr. Ure, stated that the temperatures used by distillers and brewers were very different, in consequence of the difference of the materials used in brewing distillers' wash and brewers' worts. The distillers use sometimes only one-tenth part of malt, and the remainder bruised barley, or other corn; and were they to use such high temperatures, in the first mashing, as those used by brewers who use only malt, the mass would get coagulated like thin batter,—or the tun set, as it is technically termed. The distillers, however, after making their first infusion at much lower temperatures than brewers, bring them up, before running off the worts, by the addition of water, at as high a temperature as any used by the brewer. Mr. Black seemed also to object to so high a temperature as Mr. Martineau mentioned for the first infusion, 180° F., but preferred 10° or 12° lower, the heat being afterwards brought up in the same way as in the distillery.

Section C.—Geology and Geography.

Thursday.

Mr. Bowman read a paper on some skeletons of fossil vegetables, found by Mr. Binney, in the shape of a white impalpable powder, under a peat bog near Gainsborough, occupying a stratum four to six inches in thickness, and covering an area of several acres. It remained unchanged by the sulphuric, hydrochloric, and nitric acids, and by heat, and was concluded to be pure silica, in a state of extremely minute subdivision. On submitting it to the highest power of the compound microscope, it was found to consist of a mass of transparent squares and parallelograms of different relative proportions, whose edges were perfectly sharp and smooth, and the areas often traced with very delicate parallel lines. On comparing these with the forms of some existing Confervæ, Mr. Bowman found the resemblance so strong, that he entertained no doubt they were the fragments of parasitical plants of that order, either identical with or nearly allied to, the tribe Diatomaceæ, which grow abundantly on other Algæ, both marine and fresh-water, but are so minute, that individually they are invisible to the naked eye. To enable the Section to judge for themselves, Mr. Bowman exhibited highly-magnified drawings of some of these, from the works of Dr. Greville, and also of the powder, which showed the resemblance to be complete. They are, therefore, the counterparts of the fossil Infusoria of Ehrenberg, and occupy the same place in the Vegetable kingdom as those do in the Animal.

The President observed, that, as far as he was aware, the discovery was quite new to science. He instanced, that some minute floating Confervæ had been found on the Lake of Neuchatel; and Mr. Bowman said he had observed something similar in the lakes near Ellesmere, which annually took place, and rendered it probable that a like deposition of their remains was now going on.

Sir Charles Lemon reported, that an interview had taken place between the Government and the Committee appointed at the Newcastle meeting for taking steps towards the preservation of mining records; and Mr. De la Beche mentioned, that a person had already been appointed for the purpose, and would enter on the duties of his office next year.

Mr. Murchison then exhibited a Geological Map of Europe, coloured by Von Dechen, and the first part of a work on Petrifactions, collected by M. von Humboldt, in South America. This latter work has led to some important conclusions—no oolitic or jurassic strata seem to exist in South America, or perhaps even in North America; but there is a large developement of the tertiary series, and a still larger of cretaceous in the southern continent. Specimens of Silurian fossils have been brought to the present meeting of the Association, collected in North America, by Prof. Shepard, of Newhaven.

In reference to the map of Europe, Mr. Greenough gave it as a highly probable opinion, that under the morasses of Northern Germany a valuable coal-field may exist.

Mr. Murchison then called the attention of the meeting to a section of part of Germany which he had lately visited. Mr. Murchison stated, that having, with Prof. Sedgwick, examined the older rocks of Western Germany and Belgium, it is their intention to lay before the Geological Society of London a memoir, illustrated by fossils, on the classification of those ancient deposits, a succession of the Carboniferous, Devonian, and Silurian systems. His present communication bore only on one point of this analysis, offering to prove the geological position of the anthracite or culm-bearing strata of Devonshire and Cornwall. Transverse sections, in descending order, from the productive coal-field of Westphalia on the N.N.E., to the uppermost division of protozoic rocks on the S.S.W., were explained; and one from Dortmund, by Schelke, to the neighbourhood of Limburg and Iserlohn, was specially adduced, in which the various masses of strata are clearly exposed, viz. 1. Coal shales, coal, &c.—a productive coal-field. 2. Millstone grit series, with many impressions of small plants, and occasional thin seams of coal. 3. Thinly laminated carbonaceous sandstones and shales, containing many plants, together with bands of flat bedded, black, bituminous limestone and shale, charged with Posidonia and Goniatites, and alternating with courses of "Kiesel schiefer," or flinty slate. 4. Carboniferous limestone, of great thickness, like the British, and loaded with many well-known fossils. 5. Devonshire rocks, black schists, grey and red sandstones, with occasional calcareous courses, and numerous fossils, the old grauwacke of the Germans. The order and sequence of these strata are indicated and maintained along the lower edge of the whole range of the Westphalian coal-field, the beds necessarily rising to the surface at angles of 30° to 40°, in perfect conformity, and showing throughout the clearest and most complete transition into each other. It was particularly to the group No. 3, that Mr. Murchison directed attention, being quite identical with the culm-bearing strata of North Devon and Cornwall, first described by him and Prof. Sedgwick as a portion of a true coal-field, and as not belonging to the graywacke, or older transition rocks—(see *Athen.* No. 461.) The Westphalian sections establish the geological position of the Bideford culm strata more clearly than any stratigraphical evidence in Great Britain, by presenting five masses of unequivocal mountain limestone, rising from beneath the black limestone and culmiferous schists, and thus the precise age of the latter is demonstrated. In regard to the rocks of the Devonian system, or old graywacke, which support in mountain masses the carboniferous system above alluded to, Mr. Murchison offered a brief and general sketch, promising, that in the ensuing session of the Geological Society Mr. Sedgwick and he will show that these rocks fairly represent the British old red sandstone, or Devonian system. This latter term foreign geologists do not seem disposed to adopt,

although it might save much confusion, it being now ascertained that black and slaty rocks occupy, in very extended districts, the same geological position as the red rocks of Herefordshire. Proofs of the existence of the same order and succession will be hereafter pointed out in the countries of the Hartz and the Fichtelgebirge, as well as upon both sides of the Rhine, while a splendid developement of the still older Silurian rocks, both upper and lower, will be pointed out, chiefly on the left bank of the Rhine, also in Belgium, at Liege and Namur.

Mr. Greenough was inclined now to coincide with Mr. Murchison in opinion as to the age of the culm-bearing strata of Devonshire.—Mr. De la Beche said he was open to conviction on perfect evidence, and that the proofs brought forward from Germany had been the best as yet afforded by Mr. Murchison.—Mr. Williams could not give in his adhesion; and Dr. Buckland was glad that one opponent still remained to the new theory.—Mr. Lyell referred to Mr. Lonsdale, who had been the main instrument in determining the age of the Devonian rocks. By an inspection of the fossils, he had predicted that those rocks, although different in mineral composition, would agree in age with the old red sandstone, being between the Carboniferous and Silurian systems.

Dr. Buckland announced, that the fossil Flora of Great Britain was about to be continued by Messrs. Hutton and Henslow, who solicited the loan of specimens, which might be sent to the Geological Society, and would be carefully returned, after drawings had been made from them.

Dr. Lloyd made some observations on the Geology of Warwickshire, and announced the discovery of Saurian remains in that county. He first alluded to the coal-field of North Warwickshire, between Tamworth and Coventry, in which the axis of direction has been ascertained to be N.N.W. to S.S.E. Near Nuneaton, is a quartzy rock, similar to that of Charnwood Forest, being, in all probability, an altered Caradoc sandstone; it contains manganese, and is without any organic remains; some volcanic rocks occur. Greenstone is found at Griff Hollow and at Marston Japet, showing that the district has, at one time, been disturbed; indeed, Prof. Sedgwick considers that this coal-field has been elevated during the deposition of the lower member of the new red sandstone. Between Birmingham and Warwick may be seen some outliers of lias, as at Knowle and Chesterton. At Warwick, a different sandstone from the others may be observed; and at Stockingford, coal, with a limestone underlying—black, smoky, and containing plants—also, occasionally, galena. In this district, there is no magnesian limestone. In the *bunter sandstein* of Allesley, near Coventry, the remains of a coniferous fossil tree have been discovered, and in the same formation a jaw bone, but it is uncertain whether belonging to a fish or a saurian. At Garrison Hill there occurs a highly calcareous rock, but it is uncertain if it can be regarded as muschelkalk; and the absence of this rock renders the division of the Warwickshire sandstone imperfect. There is a difficulty in what class to place the sandstone at Warwick, which resembles bunter sandstein, but it contains the salt springs of Leamington, and which springs are generally confined to the keuper, or upper formation. Perhaps there may be a fault in this locality, by which the sandstone has been elevated, but there seems to be no disturbance of the adjacent strata. The organic remains found in this sandstone have been regarded as belonging to the Dolichognathus, Platygnathus, and Megalosaurus—with them coprolites are found. At Shrewley Common, the sandstone is evidently keuper, containing Posidonia minuta; it bears impressions of animals; also ripple marks and worm marks. In the rag bed of the Warwick sandstone, organic remains have been found; it contains some carbonate of lime. At Warwick a little rock salt has also been found.

Mr. Strickland regarded the sandstone at Warwick as bunter sandstein, that had been elevated by a fault. At Droitwich a similar sandstone is overlaid by the salt marle.—Dr. Buckland said, that a like rock is found on the top of the variegated marle.

Dr. Ward exhibited specimens and drawings illustrative of impressions of the feet of animals on the Greensill sandstone, near Shrewsbury. Greensill Hill consists of a steep escarpment of new red sandstone, and contains four strata that have been described by Mr. Murchison, and in the second of which the impressions were found. This stratum, when exposed to the atmosphere, always splits so as to exhibit ripple marks, and on these marks the impressions of feet have been observed, as well as marks of drops of rain. These last are often in an oblique direction, as if having fallen in a gale of wind, the direction of which is thus pointed out. The footmarks differ from those of the Cheirotherium, in having only three toes, armed with long nails, directed forwards, and not spread out. Nothing resembling the ball of the foot has been observed, except in a few, which have some resemblance to the impression of the foot of a dog.

Dr. Buckland exhibited impressions in sandstone from Dumfriesshire.

Mr. Knipe read a communication on a Trap Dyke in Cumberland. It commences on the east side of the river Petterell, about six miles south of Carlisle, and about two from the limestone quarry at Broadfield: its composition is like onion basalt, decomposing in concentric layers. It passes by Great Barrock Hill and Armathwaite, crossing the River Eden; then by Combe's Peak and Stony Croft, Cringle Dyke, and Renwick, about two miles from which last place a good vertical section of it may be seen, on the west side of the Raven Water, which it crosses. It is met with at Hastside Fell, cutting through the Pennine chain, its eastern termination being about the source of the South Tyne River, near which it appears to have altered the adjoining strata. Its length is twenty-two miles, and its width from twenty to thirty yards. Its course coincides with that of the great Cleveland Dyke, and it is not improbable that they may be connected; if so, a basaltic dyke, 120 miles long, crosses our island from the Solway Firth to the German Ocean.

A paper, 'On the Structure of Fossil Teeth,' by Mr. Nasmyth, was then read, illustrated by several drawings. It had been stated by some anatomists, that the proper dental substance consists of an uniform structureless substance, and of fibres passing through it; but the author was led to believe that this structureless substance is organized, and differently and characteristically in different animals, so as to be a means of classification. He employed a magnifying power of the tenth of an inch focal distance, with an achromatic condenser, and first found, in the tooth of a fossil rhinoceros, the appearance of cells or compartments, and afterwards found it to exist in recent teeth. He also examined the fibres of different teeth, and found that generally they presented an interrupted or baccated appearance, as if made up of different compartments, each class of animals presenting a different arrangement.

In a paper read before the Medical Section, Mr. Nasmyth treated more fully of the organization of the dental inter-fibrous substance, and entered also into some details on the structure of the pulp.

Mr. Darwin announced, that a work on fossil teeth, by Prof. Owen, would shortly be published.

A communication on Peat Bogs, by Dr. G. H. Adams, was then brought before the meeting. The author had examined microscopically many specimens of peat, and had found them to consist of bundles of little capsules, somewhat similar to bunches of raisins, attached to the radicals of the plants growing on the surface of the bogs. These, he thinks, have never been observed before, owing to old black portions of bog having been examined. He considers that fallen trees have no connexion with the formation of peat, except as furnishing carbonic acid gas from their decay. He attributes great importance to the well-known power of plants in separating carbonic acid from the atmosphere, and conceives that the preservative power of peat is owing to tannin, which substance may have escaped detection, from its being united to iron, so abundant in heaths, accounting thus for the dark colour of the lower parts of peat formations. The author considers, that the absence of peat in America is owing to the non-existence there of the family of Ericæ. He remarks, also, that peat does not serve as a manure, from its little tendency to decomposition; and he proposes to assist the decomposition by means of sulphuric acid—thus rendering available for agriculture large tracts of bog land now lying useless, especially in Ireland. He compares the analysis of Apotheme, the chief constituent of vegetable mould, with that of gallic acid, and thinks that the action of sulphuric acid on the latter, as contained in peat, would probably produce the former, which is the chief support of vegetation. If putrifying vegetable matter be mixed with peat, its unpleasant odour at once ceases. The author urges the importance of destroying this preservative power of peat, so that it may be converted into a manure—first, by destroying the plants, next by burning or paring the surface, and then adding dilute sulphuric acid to it, collected into heaps.

Mr. J. B. Yates read a paper 'On the changes and improvements in the Embouchure of the Mersey.'—He referred to the new channel in the harbour of Liverpool, which had been brought before the notice of the Association by Capt. Denham. The intricacy of access to this harbour arises from the accumulation outside of numerous beds of sand, which are frequently and suddenly changing their position and elevation. It can scarcely be doubted, that at some remote period the estuary of the Mersey did not exist at all, or, at most, in a very limited form; a forest and morass may have occupied the land between Formby Point and Helbré. Numerous trunks and roots of large forest trees are, to this day, found along the Cheshire and Lancashire shores, while extensive tracts of peat are observed in many places starting up among the sands. A violent disruption must have taken place at the mouth of the estuary, by which enormous masses of sand and marle have been thrown out, perhaps proved by the homogeneous structure of the banks on either side. In 1828, a number of human skeletons were disinterred opposite the Leasow Lighthouse, affording strong evidence that a burying-ground had formerly existed there; and a similar cemetery is discernible at Formby. This lighthouse stands in place of another, which was nearer to the sea by more than half a mile—a site which, at the time of its erection, seemed to have been firm, dry land, but was rendered useless by the encroachments of the water, which continued to increase. It was not until the sea had broken down the ridge of sand which had formed its boundary, that a strong embankment was made, extending a mile and a quarter in front of the present lighthouse. The sand banks in this estuary are tossed to and fro by the force of the winds and tides, and are constantly changing their shapes and elevations, and, having no escape, they remain pent up in the bay. In 1687, an excellent channel existed opposite to Formby Point, its depth from three to ten fathoms; but, not being marked by buoys, the Rock Channel was at that time the entrance in common use, though dry at low water. It has since become deeper, and thus a change has taken place upon the Hyle Sand Bank. A ridge, running along the middle of this bank, has been cut through by a channel having forced itself in a northerly direction, from Helbré island towards the Light Ship. The channel described by Capt. Denham at the Dublin Meeting is now useless, although used for some time with advantage; but it runs perpendicular to the course of the tide, which accounts for its present state. Fears have also been entertained, that the other channel, called the Horse Channel, was filling up. Lately, a diagonal channel has been formed, by aiding the ebb current of the tide in its natural diagonal course, between Lancashire and Cheshire. This was done by dredging, by means of a double-toothed harrow, twelve feet across, dragged backwards and forwards by a steamer of 100 horse-power over the intruding banks, the inner part of which was stated to rise forty-three feet higher than the outer or seaward part. An enormous wooden scraper is also used. The matter taken up appears to contain a small portion of peat, and weighs somewhat lighter than the sand found within the estuary. This new channel has been proved to answer the purposes of navigation beyond original expectation, and the approach to Liverpool is even better than before.

Mr. De la Beche mentioned, that submerged peat is found along many of the shores of Europe, being evidently the remains of forests that had sunk. These have been covered with sand, and now there are encroachments made upon the coasts near them, thus showing two sorts of changes of level. He was averse to any great encroachments being made on the shores of estuaries, as the natural process of scouring by means of the reflux of the tide was diminished.

SECTION D.—ZOOLOGY AND BOTANY.

THURSDAY.

Dr. Pritchard read a paper on 'The Extinction of the Human Races.' He expressed his regret that so little attention was given to Ethnography, or the natural history of the human race, while the opportunities for observation are every day passing away; and concluded by an appeal in favour of the Aborigines' Protection Society. The paper gave rise to a long and desultory conversation, in which Dr. Hodgkin, Mr. Wilde, Mr. Watson, Mr. Hall, Dr. Daubeny, Dr. Wilson (of America), Mr. Thompson, and others, took part.

A Report on the Distribution of the Pulmoniferous Mollusca in Britain, and the Causes influencing it; drawn up at the request of the Association, by Mr. E. Forbes.—The object of this inquiry was to ascertain the geographical and geological distribution of pulmoniferous mollusca in the British isles. The subject was considered under three heads: first, a view of the various influences which affect their distribution; second, a detailed view of the distribution of the indigenous species in the various provinces of Britain; and third, the relations of that division of the native Fauna to the Fauna of Europe, and the distribution generally of the more remarkable species. Under the first head, after enumerating the various species of pulmoniferous mollusca inhabiting Britain, Mr. Forbes proceeded to review the causes influencing their distribution, dividing such causes into primary and secondary. Under the head of primary causes, he considered the two influences of climate and soil. The influence of climate in Britain is indicated by the reduced number of species found in the more northern or colder districts, as compared with the number inhabiting the provinces of the south and centre. It is also indicated by the disappearance of species which inhabit soils indifferently, as we advance northwards, and by the presence of species in certain situations in southern and warm districts, which usually avoid, or are sparingly found in such localities. It is further shown by the tendency of individuals to multiply in temperate situations, and by the superior beauty of colouring displayed by species inhabiting warm districts. The author then pointed out, that there existed in many places a stronger influence than climate, and showed that this influence was in its nature geological. He showed that various kinds of rocks influence the distribution of mollusca; that calcareous rocks are especially favourable to their distribution; and that all rocks containing much lime tend to increase both the number of species and of individuals living on them. Certain species are confined altogether to certain rocks, others to a class of rocks; and instances of the occurrence of such phenomena in Britain were enumerated. Some rocks influence the distribution *negatively*, diminishing the number both of species and individuals. The order of influence of rocks on species in Britain, is as follows, commencing with the most influential:—

1. Cretaceous and oolitic.
2. Carboniferous rocks and trap.
3. Tertiary.
4. Saliferous.
5. Slates.
6. Granite and Gneiss.

Mr. Forbes noticed, that in certain cases climate neutralized the influence of the rock, and *vice versâ*; and instanced Guernsey, as a locality where the neutralization of geological influence by climate is *positive*, and Shetland, where it is *negative*. Under the head of secondary influences, Mr. Forbes considered the effect of the neighbourhood of the sea—the neighbourhood and elevation of mountains—the presence of woods, and the influence of the various trees found in them—the influence of water, especially of artificial water, as canals, and the vitiation of the Fauna by the agency of man, as in the case of the transportation of species by ballast, &c. Instances were given of the effect of these various influences in Britain, and the comparative effect of each on the existing Fauna considered. It was stated, that, in our country, the influence of elevation is always negative, but that in many other countries it is positive. It was shown also, that fossils, especially those of the newer pliocene strata, materially influence the Fauna in certain localities. A detailed view of the distribution of the species was then entered into. They were arranged under ten districts, viz. 1. the Channel Isles; 2. S.E. of England; 3. S.W. of England; 4. N.E. of England; 5. N.W. of England; 6. S. of Ireland; 7. W. of Ireland; 8. S. of Scotland; 9. W. of Scotland; 10. Shetland Isles. Tables were shown, exhibiting the relative importance of the various influences in each, and the causes of the presence of the more local species were considered. *Helix revoluta* and *Helix naticoides* were mentioned as additions to the British Fauna from Guernsey. The researches of Mr. Alder, of Newcastle, and Mr. Bean, of Scarborough, were particularly alluded to, and much novel information contributed by those gentlemen mentioned. Mr. Forbes then considered the distribution of the principal British species in foreign countries; and in a table exhibited a comparison between the principal published lists of Europe. The southern countries present much fuller lists than the northern. In the number of native species of helix, England exceeds Scandinavia by seventeen species, and Brabant by fifteen, but yields to the other European lists of equal importance, especially those of the southern countries of Europe. France exceeds Britain by no less than forty-one species. The *Helix fusca*, the *Clausilia Rolphii*, the *Pupa anglica*, and the *Lymnæa involuta*, of Thomson, were mentioned, as species only found in Britain. Many remarkable instances of extensive distribution were mentioned. The common snail, *Helix aspersa*, is equally common throughout southern Europe, and is found also in parts of Asia, Africa, and North and South America; and the edible snail is nearly as widely distributed. The *Succinea amphibia* is very widely spread over the world, being found throughout Europe, from Archangel downwards, in North America, and in North and South Africa, as far as the Cape of Good Hope; and the *Succinea oblonga* has also a very wide range. The consideration of the distribution of native species in foreign countries, was pressed as an important part of the examination, since, without such consideration, many fallacies may arise in drawing our conclusions.

Mr. Lyell observed, there were several points in relation to the distribution of recent animals that geologists required to know. In the first place, the influence of various kinds of rocks on the distribution of species. Strata in various stages of their growth contained various species. What were the laws which regulated this distribution with existing species? The mere chemical influence of strata is important. Freshwater shells exist without marine, and *vice versâ*; and it was desirable to know what was the influence of rocks in their neighbourhood upon them. It was desirable to know the chemical composition of rocks, as in many instances this must have great influence. Mollusca, for instance, formed their shells from lime, which they must have taken up as food. Again, a knowledge of the distribution of subaqueous species became important; and the sediments in the beds of rivers, and places where they are found, should be carefully observed and recorded; also the depth of the waters in which they are found, and the fuci or other plants which may grow in their neighbourhood. Shells are the most frequent organic remains, and therefore the most important. Mammalia, fishes, and reptiles are frequently absent in strata, but shells never. One of the great difficulties in studying these shells, was a want of knowledge of those which existed. As we passed through each stratum, the shells of each resembled more and more those of the strata above it, the nearer they were to it. Now the question presented itself in some of the upper strata, as to whether conchologists might not have overlooked existing species, and thus animals be thought extinct which are not so. Mr. Bean, of Scarborough, had lately found a shell that was supposed to be extinct. Another point of importance is the relation of shells to each other in a given district, such as the relation of the shells in rocks to those found in the sea near them. He had lately proposed the question to Messrs. Gray and Sowerby, as to whether there was any means of determining the relation between the number of the species of shells in the Mediterranean and the seas of the north of France. They told him there was no satisfactory means of doing so. They differed in their estimate, and the amount of information was of little value.

Mr. J. E. Bowman exhibited specimens of a species of Dodder (*Cuscuta epilinum*), first found in Britain, two years ago, by himself; and again in a new locality, within the present month. He believes it is to be found exclusively upon flax, and has been overlooked for *C. Europæa*, from which, however, it is quite distinct in its pedunculated heads, globular tube of the corolla, and the insertion of the stamens above the tips of the scales, which are geminate or bifid, with the lobes divaricate or fimbriated. As he observed these scales to differ a good deal from each other, even in the same corolla, he cautions botanists against trusting too much to them as a specific character, without further observations. Still less does this agree with the continental *C. epilinum* of Weihe, which is described as "simplex, glomerulis ebracteatis, sub 5-floris;" because the new plant is sometimes branched, has its heads always subtended by a broad bractea, and each head, when luxuriant, consisting of eight, ten, or twelve flowers. Still, as the specific name is so strikingly characteristic of its habit of growing always on *flax*, and is indeed as old as Dodonæus and Gerarde, the author contends that it ought to be retained; and that Weihe's plant (if such an one there be, though he suspects some mistake,) should be named anew, or its character be revised. Mr. Bowman then described the peculiarities in structure of this singular parasite. When it has fixed itself upon the flax, the root and lower part of the stem shrivel up and die away, and a group of little warts or tubercles is produced from the inner surface of the spire between each head, which strike into the flax and extract its juices. This economy places each head nearly in the situation of an independent plant; so that, if the stem were separated at intervals, each detached portion would continue to flower and to ripen its seed. This view occurred to him, on observing that the stem gradually thickened upwards as it approached each head, and was again reduced to half its diameter immediately above it; each head being thus dependent on its own subordinate system of exhausting suckers. Another beautiful compensation for the loss of the root, and supporting the view just advanced, is found in the succulent nature of the flowers, which are as fleshy as the leaves of the mesembryanthemum tribe, and contain reservoirs of nutriment to insure the ripening of the seed, and supply the deficiency consequent on the desiccation of the flax. The author adverted to the total absence of green colour in the dodder and other parasites, which is generally considered to be owing to their not *directly* elaborating their juices from the soil. But the misseltoe is green, though truly parasitical. Others suppose the want of colour to arise from their growing in the shade, or being destitute of leaves; but the dodder, though leafless, grows in the full sunshine; and lathræa has real leaves, though they are buried in the soil, amply furnished with stomata, which line the inner surfaces of cylindrical cells, and are most wonderfully adapted to their anomalous situation. In fact, they are true leaves turned inside out. The real explanation of the absence of green in plants arises, in all cases, from the want of stomata or pores in the cuticle or outer skin; for these pores are the lungs, and through them alone the atmosphere can be admitted, and chemically decomposed, by the action of light; some of its ingredients ministering to the support of the plant, and others entering into new combinations to produce that beautiful variety of verdure, which is the usual summer livery of the vegetable world.

A Paper was then read 'On the Cultivation of the Cotton of Commerce,' by Major-Gen. Briggs. The objects proposed in this paper are—First, to excite inquiry on the various species of cotton plant that produce the cotton of commerce. Secondly, to ascertain the nature of soils adapted to each. Thirdly, to prove the practicability of cultivating the plant in India, for the supply of the British market to any extent. Of the species that produce the various cottons of commerce, we have at present very little accurate knowledge, and this has arisen from the alterations undergone by the plant in the process of cultivation. But there can be no doubt that the plants which produce cotton in America, Asia, and Africa, are of decidedly different species. The plant that produces the Brazil cotton, probably the *Gossypium hirsutum*, grows to the height of from ten to twenty feet, is perennial, and produces cotton with a long and strong staple, and moderately fine

and silky. The plant common to the West Indies, said to have been imported from Guiana, is triennial, bearing abundantly a fine silky long staple, and is the *Gossypium barbadense* of botanists. This also is the plant which produces the Sea-island cotton. When this plant was carried from the coast into the interior of Georgia and Carolina, in the United States of America, the seed changed from a black to a green colour, and the staple became shorter, coarser, and more woolly. This plant was afterwards introduced into Egypt, and is the same that produces the Bourbon cotton, cultivated by the French on that island. Mr. Spalding, in a letter alluded to by Mr. G. R. Porter, in his work on tropical productions, records several varieties, attention to which is of the greatest importance to the cultivation, since they vary in the character of their staple, in the shape and size of their pods, in the hue of the cotton, and in the duration of the plant. The common indigenous plant of India is the *Gossypium herbaceum* of botanists, and differs in appearance from the cottons of the Western world; besides which there is the *Gossypium religiosum*, producing the brown cotton extensively grown in China. It is of the former plant I would desire to speak more especially. It is usually cultivated as an annual, but has been successfully treated and grown as a perennial by the process of pruning down when the cotton is gathered. The produce of this plant is not inferior in fineness, and is superior in point of richness of colour, to the best cottons of America. The staple is however short, and by the great neglect hitherto evinced in picking the produce at the proper time, and carelessness in allowing particles of dried leaves, or the calyx of the flower to adhere to the wool, it fetches a lower price, and is considered an inferior article, in the English market, to the New Orleans and Georgian of America, though really superior in quality and durability. There is another kind of cotton produced from a species in Africa which Dr. Royle considers allied to the *Gossypium herbaceum* of India. We now come to speak of the soils in which these plants are cultivated. Several specimens of American soils on which cotton is grown, have been analyzed by Mr. E. Solly, and he finds them generally to consist—first, of a preponderating quantity of sand (silex). Secondly, of alumina or clay. Thirdly, of the oxides of iron and manganese, which give the varying colours to the soil. Fourthly, of very small proportions of carbonate and sulphate of lime. And lastly, of organic matter in two states; a fibro-vegetable and a soluble matter forming from four to eight per cent. Soils of this kind where hardly anything else will grow, are adapted for the cotton plants of America; a fact mentioned by Mr. Porter, and confirmed by Mr. Gray, who was for some years a cultivator of the plant in America. The land on which the indigenous plant of India termed *Gossypium herbaceum* grows, is very different. It is composed chiefly not of sand (silex) but of the results of the decomposition of trap rocks, the *debris* of the mountains that constitute the extensive trap formation of central India. This soil lies upon or borders on the limestone; it contains a large quantity of vegetable matter, abounds in oxide of iron, is retentive of moisture, and forms a rich tenacious loam approaching to clay. Such is the soil of the indigenous cotton plant of India, and therefore differs from that of America, so that we ought not to be surprised to learn that all attempts at cultivating the American plant in this soil have failed. But there are in India abundant other soils on which the indigenous plant will not thrive. These prevail in Bengal, on the Coromandel coast, and in fact throughout India. They consist mainly of the detritus resulting from the disintegration of rocks of the primary and secondary formations, such as granite, gneiss, sandstones, with here and there lime, producing a light soil, fertile or otherwise according to the quantity of organic matter it may contain. The indigenous plant will not grow here, but the American plants thrive on it. This has been proved by experimental farms near Bombay, and the Western Coast, in Upper Hindûstan, on the Malayan Peninsula, and on the shores of Coromandel, in all of which tracts the American plants are growing at present in much perfection, though not in quantities sufficient to make any impression on the cotton market of this country. India could supply all the cotton Great Britain can ever require, even from her indigenous plants, but for local obstacles. The soil, favourable to the growth of this article, however, is situated in a central region removed from the coast, and the trade consequently labours under the difficulty attendant on a lengthened journey by land. This will not be the case when the cotton is grown on the lighter soils of the coast. Here every facility exists for its exportation, for there is no doubt that an article equally good might be obtained at a much cheaper rate than that now procured from America.

Mr. Felkin stated, that there was no objection to Egyptian cotton on account of its quality, but it could not be bleached. There was also much sand in it; this was why it was not more used; and no cotton, however cheap, would be purchased in the market with these drawbacks.—In answer to an inquiry, Gen. Briggs stated, that the nankeens of commerce were made from a naturally brown cotton, probably the *Gossypium religiosum*. This was a very different plant from the indigenous cotton of India.—Mr. Danson had seen cotton from Peru equal to Sea-island, in point of silkiness, length of staple, &c. The specimens of cotton from Burmah, now exhibited, he thought were of a very superior quality. Other products, he thought, might be imported from the East, such as wool.—Gen. Briggs did not know where the wool of the East Indies was brought from. Shawls were embroidered at Delhi, but not manufactured. Many of the products of the East Indies could be imported; but it was a curious fact, that at the present moment, although we had possessed India so long, we absolutely knew nothing about its productions and capabilities. We had sent annually from England thousands of gallons of linseed oil to India, whilst millions of pounds of the seeds of linum were rotting throughout the whole country. There were not less than fifty species of plants, from which we might obtain caoutchouc; and yet we had imported but little from thence.

Section E.—MEDICAL SCIENCE.

WEDNESDAY.

Mr. Evans presented to the Section an extraordinary case of Spina bifida. The patient was a boy of twelve years of age, enjoying excellent general health in other respects; he was strong and active, but his head seemed enlarged from chronic hydrocephalus. The tumour occupied the lumbar regions, was semi-transparent, and the size of a child's head.

'Observations on Poisoning by the Vapours of burning Charcoal,' by Dr. Golding Bird.—Dr. Bird stated, that he was induced to examine into the subject experimentally, from the discordant opinions hitherto published on the various questions connected with it in a toxicological point of view. An opinion has been held, that vapours of carbonic acid were more injurious when produced by the combustion of coal and charcoal, than from any other source, on account of the admixture of light carburetted hydrogen gas. This opinion he dissented from, as it was well known that in coal-mines the fire-damp, as this gas was called, was inhaled with perfect impunity. To ascertain the *modus agendi* of the gas when inhaled, he made numerous experiments, by immersing animals in different mixtures of it and atmospheric air, as well as in the pure gas. In the latter case, the animals died asphyxiated, as when immersed in water or mercury, the spasm of the glottis preventing any portion of it from being inhaled. If not more than 25 per cent. be present, then respiration will go on, and its true poisonous effects take place. As to the amount of this gas necessary to produce fatal effects, Dr. Bird found that as a general rule, any quantity above 3½ per cent. was capable of producing death. Two opinions prevailed on the nature of these properties: the first was, that the gas acted negatively, as pure nitrogen or hydrogen is known to do, by preventing the due supply of oxygen. To test this opinion, he formed a mixture containing twenty-one parts of oxygen, and seventy-nine of carbonic acid, and death followed instantly from immersion in it; and the same result followed when the proportions were reversed, although a taper burned brilliantly in the latter combination; showing, that the burning of a light in any suspected situation is not always a safe test of the absence of danger. The second opinion is, that this gas, when respired, exerts a specific poisonous action on the nervous system. This latter, Dr. Bird adopts, from various considerations drawn from his direct experiments, and from the symptoms observed in numerous cases. These are principally those denominated cerebral, such as head-ache, vertigo, suffused eyes, mental horror to an intense degree. Even with these symptoms, respiration may go on freely. Death is frequently preceded by vomiting, which is a marked symptom of cerebral disease. In cases where recovery has taken place, the sequelæ are decidedly of nervous character: they have been, partial paralysis, dumbness, and idiotcy; and this poisonous effect he thought took place independently of absorption, from its immediate effects on the nervous system, to which it was applied. Death has also been induced by its external application to the body, without its being, at the same time, respired. Dr. Bird related some experiments of Dr. A. T. Thomson, in which the pain of inflamed surfaces was instantly removed on their being plunged into carbonic acid. He dwelt on the pathological effects of the gas as exhibited after death, and concluded by pressing the importance of minute post mortem examinations in every case of death from this cause coming under the notice of medical men.

A member stated from his own experience, that in the burning of charcoal a quantity of carbonic oxide is generated in many instances, and this must be taken into account in any accurate examinations of the question.—Prof. Macartney observed, that when the egg which has been for some time in process of incubation is placed in carbonic acid, and the temperature preserved, the developement of the chick ceases; and this he deemed a strong proof of the action of the gas being on the nervous system, as in this case there is no respiration, and the process supplementary to it is not at all interfered with.

Prof. Macartney then read a paper 'On the Rules for finding with exactness the Position of the principal Arteries and Nerves, from their relations to the external forms of the body.'—He first alluded to the fact demonstrated by painters and sculptors, that the proportions which belong to the external figure of the human body are, in general, regulated by the primary relations of duplicates and thirds, and their multiples; and that he had discovered that a similar law of proportion prevailed with respect to the internal parts of the body—more particularly with regard to the trunks of the arteries and nerves, in relation to the limits of external form. They sometimes take a middle line along the limb, as may be observed in the sciatic nerve, but more frequently they occupy lines dividing the external form into thirds, or proceed from the median line of the side of an extremity to the middle of the opposite side; or they may pass from the middle to the division into thirds, or from a point placed on a line dividing the external form into three equal parts, and then approaching the middle, so as to form, with the fellow, two parts of a triangle. He illustrated this rule by applying it to the entire course of the artery of the upper extremity, and its principal divisions, from the subclavian to the palmar arches, and from the course of the occipital arteries. He remarked, that the common mode of dissecting arteries and dried preparations was calculated to lead into serious errors, in consequence of which he had been in the habit of teaching relative anatomy, by successive removal of the layers placed above them, so as not to disturb their lateral connexions. The position of the three facial nerves, where they emerge from their foramina, illustrate the same rules, being placed on vertical lines, dividing a well-formed face into three equal parts. Prof. Macartney laid down exact rules for finding the exact points of their emergence. He was not aware that any attempts to lay down proportional measurements had been made in England as a guide in operations, though a few rules have been laid down on this subject by Lesfranc and Manec, in France. After forty-one years' experience of those rules, he could relate numerous cases of their great value in operations, and of the unfortunate results of ignorance of such guides, in cases where operations were performed. In conclusion, he showed that the same primary relations of two and three regulate the progressive movements of animals provided with extremities, and determine also their powers of perception and comparison; and that they constitute the foundation of the rhythm of music and of language. These positions he illustrated by reference to the perceptive powers of man as exercised by

the different senses, particularly those of sight and hearing.

'On the Cause of the Increase of Small-pox, and of the Origin of Variola-vaccinia,' by Dr. Inglis.—Dr. Inglis stated, that variola was every year upon the increase, the cause of which was, not that vaccination was inefficient, or that the virus had degenerated, but that, from a long immunity from small-pox, the public had ceased to think vaccination necessary; and he suggested that government should be petitioned by the Medical Section of the British Association to enforce (as is done abroad), not only the vaccination of every child born in the kingdom, but the re-vaccination of every man in the British Service. He next adduced proofs from the Cow-pox Institution of Dublin, from foreign reports, and from the innumerable cases of successful re-vaccination, that the vaccine virus had not degenerated, but that the human system did undergo a change during some unknown number of years. In Ripon, during the year 1837, variola prevailed extensively as an epidemic, and Dr. Inglis observed at that time innumerable cases of varicella; those affected with chicken-pox were principally children upon whom vaccination had not recently been performed, and those who had chicken-pox, without vaccination, seldom contracted small-pox. The two diseases appeared to Dr. Inglis to arise from one cause. Many cases, to prove the convertibility of the one disease into the other, were adduced. Dr. Inglis, having full faith in the efficacy of vaccination and of re-vaccination, after first inserting the vaccine lymph, inserted into his arm in several places, the virus from variolous patients in different stages of the disease, and, in one instance, from a patient who was dying from the disease, but in none of them did he succeed in inducing an eruption: the inflammation and pruritus was considerable for a day or two, but then gradually subsided. That the vaccine virus, therefore, decreases in its preventive influence is a supposition at least difficult of proof, for, from the beginning, this prophylactic power was imperfect in different degrees, and even an attack of small-pox itself, is no certain security against a second or even a third attack. The next point in the paper was to show that the two visitations of small-pox and vaccination could and did go on in the system at one and the same time, distinct cases of which were brought forward. Now, since two dissimilar contagious irritations cannot run their course together without the one impeding the other for a time, Dr. Inglis was led to suppose that variola and variola-vaccinia had the same common origin, or rather that vaccinia sprung from variola. The paper concluded by the following brief summary:—1st, That small-pox is decidedly on the increase, and that during each successive epidemic there is an increase of variolous patients from amongst those who were vaccinated in infancy. 2nd, That the vaccine virus is as effectual now as ever it was, but that re-vaccination is necessary after a period of years, as yet unknown. 3rd, That the same cause which produces small-pox during a variolous epidemic in the unvaccinated, may and does give rise to chicken-pox in the vaccinated. And 4th, That there is every reason to believe that cow-pox had its origin in variola.

'On the New Vaccine Virus of 1838,' by Mr. J. B. Estlin.—The paper stated that the author had procured some fresh vaccine lymph from the cow in August, 1838, and that in consequence of much dissatisfaction among medical men with the matter previously supplied by the National Vaccine Establishment, numerous applications were made to him for the new lymph, and that it soon became extensively employed. The object of the present communication was to show, that the powers of the new virus diminished in intensity as successive vaccinations increased its distance from the cow. The author had watched it through forty-eight subjects in succession, and for nearly twelve months. During the first three or four months, rather severe local and constitutional effects followed. During the latter months, however, of the year of trial, the activity of the matter had greatly diminished; while the vesicle at the present moment produced by it retains all the characteristics of perfect cow-pox, as described by Jenner. The author also referred to some experiments lately made by Mr. Ceely, of Aylesbury, in which cows were inoculated with the matter of *small-pox*, the result of which was, the appearance of the regular *vaccine* vesicle upon the inoculated part of the animal. From this vesicle, lymph taken and introduced into the human subject, produced the genuine cow-pox.

Dr. Baron informed the Section that he was about to publish a Report on the subject of variola, and that therefore he would not enter fully into the question, but he wished to state the principal arguments for the identity of variola and what Jenner denominated variola-vaccinia, or cow-pock: the general conclusions he arrived at were as follows:—1st, That cattle in many ages and different countries have been affected with small-pox. 2nd, That those invasions have been simultaneous with the occurrence of the disease in man. 3rd, That it appeared in England, in the year 1745, again in 1770, and continued until 1780. 4th, That the casual transmission of this disease, preventing the accession of small-pox in man, induced Jenner to propagate the affection from one human being to another. 5th, That when severe among animals, severe also in the human subject. 6th, That as it has been propagated from the cow to man, it has also been transmitted from the human subject to the cow, by inoculation. 7th, That the disease becomes milder when transmitted to the cow, still preserving *its protecting* influence.

Sir James Murray again adverted to a subject brought forward by him at the meeting at Liverpool (see *Athen.* No. 517), the urinary secretions in the circulating fluids.

THURSDAY.

'On Alkaline Indigestion,' by R. D. Thomson, M.D.—The author stated that he had brought this subject before the British Association at Bristol, but that since that period he had not only from ample experience confirmed the results of his former inquiries, but had elicited several other conclusions of importance. In the healthy state, there is no doubt that during a portion at least of the process of digestion the contents of the stomach are in an acid state. Some had concluded that this acidity proceeded from the presence of muriatic acid, upon what grounds Dr. Thomson would discuss in the Chemical Section (see *ante*, p. 675); others that it proceeded from acetic or lactic acid. 1. Whatever this acid may be, there is no doubt that when it accumulates to a certain extent, the stomach can no longer sustain it, and disease ensues in the form of heartburn, acid eructations, &c. 2. Where the contents of the stomach assume any condition offensive to that organ, either from too much acid or from too small a proportion, the stomach, in many cases ejects a clear fluid, which Dr. Thomson has found to be accompanied by different symptoms, according to the chemical re-action of the fluid: thus in heartburn an acid fluid is ejected, but without any cessation of pain in the stomach; while, on the contrary, if a neutral fluid be ejected, according to the experience of the author, the pain is alleviated on the instant that the fluid is got rid of. This is a more rare case of indigestion, but the author has met with it several times. It may be termed *Neutral Indigestion*. 3. The third form of indigestion which Dr. Thomson has met with is the alkaline state of the contents of the stomach. He terms it *Alkaline Indigestion*. The peculiar features of this disease are a violent pain in the region of the stomach, accompanied sometimes with a feeling of fainting, headache, and more rarely an inclination to vomit. Suddenly a sensation of spasm comes on, as if some contraction were taking place, and the patient speedily finds his mouth full of water, which he is obliged to empty. This operation he has no sooner performed, than he requires to repeat it, and at last a continuous stream flows from his mouth, which endures for some time, when it ceases, and along with it the pain of the stomach. This, together with the chemical re-action of the fluid ejected, appears to distinguish in a very complete manner, alkaline and neutral indigestion from the acid state, all of which have been confounded by former writers. The distinction is the more important, because these different forms require, in some measure, opposite modes of treatment. With regard to the cause of the alkaline re-action, Dr. Thomson stated that after evaporating the fluid emitted from the stomach, and igniting the residue, he had obtained, by crystallization, fine crystals of carbonate of soda. The presence of these, however, he ascribed often to the decomposition of common salt by the process, or to the previous existence of lactate of soda in the fluid. He was more inclined to attribute it to the former source, because the quantity of crystals was so very considerable. Dr. Thomson stated that the ejection of these fluids from the stomach was much more common than was usually imagined, as out of forty or fifty patients admitted daily at the Blenheim Street Dispensary, in London, he generally found one or two affected with such symptoms. For some years past he had made it a rule always to examine these fluids, and the results of his experiments were embodied in his present communication. He observed that these complaints were frequently symptomatic of diseases placed in other organs, as the uterus, liver, &c. But the secondary disease was often the more disagreeable, and therefore required to be as carefully treated as the original one.

Mr. Hodgson read a paper, 'On the Red Appearance on the Internal Coat of Arteries,' which, he stated, did not depend on inflammation in every instance, and from which it should be carefully distinguished; it might occur extensively, or in small patches, or in different parts of the same subject, presenting different shades of colour. It was found in subjects of all ages, in healthy as well as morbid coats, in the lining membrane of the heart, and of the veins, but less frequently in the latter. It may be found when blood is present in those cavities after death, or where they are completely empty. Mr. Hodgson related the experiments of Laennec and Andral, which proved that this red appearance might be communicated after death by immersing the vessels in blood. As to the efficient cause, he stated, that it might proceed from imbibition, in the same manner as we find the neighbouring membranes stained with bile from the gall-bladder and its ducts; the first changes towards decomposition and putrefaction might allow of it more readily. Some writers look on it in every instance as the result of inflammation; slight modifications of vitality may permit its occurrence during life, as we find it, where chronic inflammation has existed, giving rise to deposits of an atheromatous matter. When dependent on inflammation it will be found affecting the inner coat only, but when on other causes it will often pervade the elastic or middle coat as well as the serous. Finally, he stated that it might be found depending on the co-existence of those causes which were capable of producing it singly.

Mr. Hodgson repeated the statements which he made after the reading of Dr. Macartney's paper, on Tuesday; that, although nature does sometimes use other means for suppressing hæmorrhage, the most frequent mode was a vital constriction and contraction of the coats of the artery, and that this constriction and narrowing of the arterial tube may be produced by exposure and by pressure. That this is the mode adopted to prevent the hæmorrhage in cases of Gangrene, when separation is effected. In support of these views, he presented to the Section some preparations and drawings, particularly illustrating the various conditions in which arteries are found, after successful operations for aneurism: true aneurism, he pointed out as depending on a weakening and degeneration of the middle coat of the artery.

Dr. Macartney thought that it was of importance to discriminate between the red appearances described by Mr. Hodgson and inflammation; they had a painted appearance, were devoid of tumefaction, and were most perfectly distinguished by being insusceptible of injection. There was, he stated, much analogy in the red patches observed on the pharynx and œsophagus in cases of hydrophobia; he remarked that these appearances might not depend on the putrefactive process, but be caused more by changes in the blood itself than in the solids. Dr. Macartney dwelt on the important part played by the effusion of coagulable lymph in the closure of arteries, independent of and even previous to inflammation.

Mr. C. T. Coathupe detailed the results of a series of experiments on the Respiration of Deteriorated Atmospheres, which he had instituted to determine whether the injurious effects which have followed the respiration of charcoal vapours had depended on carbonic acid, as was generally thought, or on the specific agency of some other volatile product. The volatile products of the combination of charcoal he stated to be as follows:—

Carbonate of Ammonia,
Hydrochlorate of Ammonia,
Sulphate of Ammonia,
Volatile Empyreumatic Oil,
Carbonic Acid Gas,
Carbonic Oxide,
Oxygen,
Nitrogen,
Aqueous Vapour.

From a number of experiments on the elimination of carbonic acid during respiration, he arrived at the following results:—that 266.66 cubic feet of atmospheric air pass through the lungs of an adult in twenty-four hours, of which 10.666 are converted into carbonic acid, yielding 5.45 ounces of carbon, or 124.628 pounds annually, which will give a total of 147,070 tons of carbon as the annual product of the inhabitants of Great Britain and Ireland! The average amount of carbonic acid found in atmospheric air in which animals had expired was found to be, for warm-blooded animals, 12.75 per cent., for the cold-blooded animals, 13.116 per cent. When the animals were removed, on becoming comatose, the average amount of carbonic acid was found to be 10.42 per cent. On confining a taper until its extinction, the quantity of carbonic acid found was 3.046 per cent. From hence it would appear, that an atmosphere that has ceased to support combustion can support animal life for some time, which Mr. Coathupe proved by direct experiment.

Dr. Costello presented a report of ten cases of Calculus treated by Lithotrity. The patients were of ages between fifty-three and seventy-six, the stones varying in size from that of a pigeon's egg to that of a hen's egg. The lithotrite was successively applied at sittings of from thirty to fifty seconds. Dr. Costello strongly insisted on the necessity of this point, especially at the commencement of the treatment, as the constitution is thus saved from the shock and reaction which follow protracted operation. One of the cases was remarkable: the collected fragments of the removed calculus were shown to the Section; they filled a bottle capable of containing at least four fluid ounces. The patient had suffered upwards of ten years; during the treatment he superintended the farming of his estate as usual, without any inconvenience; the entire of the ten cases were cured, bearing high testimony to the value of this improvement in operative surgery. In connexion with these operations, Dr. Costello related an incident which, to use his own words, "exemplified the progress of surgery and steam travelling,"—he operated on three patients residing in three different counties, and travelled over a space of upwards of 200 miles in eighteen hours.

Mr. Nasmyth read a paper 'On the Microscopic Structure of the Teeth,' in which he treated also of the covering of the enamel and of the organization of the pulp. He first stated that his researches had led him to a conviction contrary to that of Retzius, Purkinje, and Fränkel, for he had found that the enamel *in all cases*, possesses a distinct envelope or coating. On the incisor of the calf, and on several other simple teeth, he had also traced in it the corpuscles of Purkinje, analogous to those found in bone.† With respect to the microscopic structure of the teeth, Mr. Nasmyth treated principally of the interfibrous substance, which he said was not "structureless," as has been erroneously stated, but decidedly cellular. The fibres themselves he described as presenting an interrupted or baccated appearance, as if made up of compartments, which differ in size and relative position in various series of animals. He detailed their peculiarities in the human subject, in some species of the monkey tribe, and in the oran-outan. After the earthy matter of teeth has been removed by acid, the animal residue, he stated, consists of solid fibres, and if the decomposition be allowed to continue, these fibres present a peculiar baccated appearance. The general appearance of the fibres treated by acid is similar to that of the fibres of cellular tissue generally, and the diameter of each corresponds exactly to the calibre of the dental tube, as described by Retzius, and which, according to that writer, is pervious, although, at the same time, he says, that it is always more or less filled with contents of an earthy nature. With regard to the internal structure of the pulp, Mr. Nasmyth stated that the number of minute cells presenting themselves in its interior, in a vesicular form, is very remarkable. They vary in size from the ten-thousandth to one-eighth of an inch in diameter, and are evidently disposed in layers. The parenchyma of macerated pulp is found to be traversed by vessels, and to be interspersed with granules. The arrangement of these cells or vessels, Mr. Nasmyth thinks, may account for the shrinking or nearly total disappearance of the pulp which he has frequently observed: their use in the economy of the part he has not yet ascertained. They are evidently filled either with air or fluid. He finds that they exist on the formative surface of the pulp. Mr. Nasmyth next proceeded to the nature of the process by which the ivory is developed. The formative surface of the pulp, which is in apposition to the ivory, and by which the latter is produced, he described as presenting a general cellular arrangement, which he denominated reticular, resembling a series of skeletons of a desiccated leaf. This reticularity is found to have peculiar diversities in different classes of animals. Mr. Nasmyth has found that a similar appearance is presented by the capsule and by the capsular investment of the enamel. The leaves or compartments of the reticulation are surrounded by a well-defined scolloped border, from which occasionally processes are observed to arise at regular intervals. With respect to the formation of the ivory, Mr. Nasmyth stated that he was not prepared with a satisfactory theory, and would only submit a few observations based on his own researches. On the surface of the pulp, he said, are found innumerable detached cells with central points, which latter are at regular intervals corresponding in extent to those existing between the fibres of the tooth. The cellules of the fragments of the ivory which are found scattered on the pulp, resemble exactly in size and appearance the cellules of the latter when in a state of transition. Mr. Nasmyth is of opinion that from the spirally fibrous frame-work of the reticulations are evolved the spiral fibres of the tooth. The diameters of the two sets of fibres exactly agree. The projections on the formative surface of the pulp correspond to the centres of the cells, may be traced to belong to their structure, and are evidently fibres passing upwards from the pulp. Mr. Nasmyth has also ascertained that the fibres of perfect ivory resolve themselves by decomposition into similar granules. He has not discovered the manner in which the osseous matter is deposited in the cells of the interfibrous substance, but he has observed that these cells are subdivided into minute cellules, for they present the appearance of being filled with smaller cells in certain progressive stages of developement. But in whatever aspect, said he, we view the formative organs of the tooth and the dental tissues themselves, and whether we examine the latter during the process of their developement or after their formation has been completed, we are everywhere met by appearances which denote a cellular or reticular arrangement. Mr. Nasmyth concluded his paper by a notice of Schwann's work on the cellular character of primary tissues, dwelling on his views of the cellular organization of the pulp, from which his own were essentially different.

SATURDAY.

Dr. Ludwig Güterbock exhibited a number of instruments made from ivory, softened by the removal of the earthy matter by the action of dilute acid. In a brief memoir on their origin, he showed, that the first idea of the preparation was not due either to the German or Parisian individuals who had claimed the honour, as it was contained in an English work, published some time ago, under the title of 'Useful Arts and Inventions.'

Mr. Nasmyth read a paper 'On the Structure of the Epithelium,' which he described as being composed of cells. He first alluded to the views of Leewenhoek on the subject, contained in letters to the Royal Society, written in 1674, and 1684-5, and according to which, this tissue is composed of scales. The researches of subsequent inquirers tend to prove that scales or cells of various forms exist on the surface of all mucous and serous membranes, on the inner membrane of the vascular system, &c. Mr. Nasmyth described the epithelium as a layer of substance destitute of vessels, covering the vascular surface of mucous membranes. The scales, as they were first termed by Leewenhoek, of which it is composed are flat bodies, with a thick portion or nucleus in their centre, and with very thin and transparent margins, which are sometimes curved; their surface often presents numerous transparent points, with very fine lines. The nucleus of the scale generally contains a small body, which has been called the nucleus-corpuscle. If the secretion be removed from an irritated mucous membrane, these bodies are found to assume the appearance of cells, but generally at the surface they resemble scales, from having increased in size, and undergone compression. In the fœtus, the well-defined scales of the epidermis are not unfrequently seen externally; the *rete malpighii* consists of newly-formed cells; and between the two may be observed other cells, in a state of progressive developement. In the epithelium generally, a nucleus is first formed, and then a cell is formed around it. These cells are connected by a gelatinous substance, interspersed with minute granular bodies, which displays considerable elasticity, and which sometimes presents a fibrous appearance. The granules can be caused to disappear by compression. In certain parts of the epithelium of the calf, distinct fibres are observed to pass over the surface of the scales, and to connect them together, thus forming a very delicate net-work. On the surface of the body and of the mucous membranes of man and animals generally, the superficial scales are thrown off by pressure from the cells beneath; but in some cases, as with frogs and efts, the epithelium scales are removed in a continuous layer; and Mr. Nasmyth is disposed to believe that it is the covering which, according to naturalists, is swallowed by the animal after having been shed. The cuticle and epithelium then are evidently organized bodies. It would appear that they are formed from a fluid secretion, and that their various stages of developement are as follows: 1st, the formation of nuclei, and their corpuscles;—2nd, that of cells;—3rd, the growth of the latter effected by vital imbibition;—4th, their compression and gradual conversion into minute lamellæ, or scales. The cells seem to have within themselves a power of growth, and it remains for pathologists to determine what share the derangement of this function has in the production of cutaneous diseases. Under certain modifications, the epithelium certainly presents vital phenomena, among which may be mentioned the ciliary motions. Mr. Nasmyth concluded his paper by an especial description of the portion of the epithelium lining the cavity of the mouth. In the fœtal subject, previous to the extrusion of the teeth, it forms on the alveolar arch a dense projecting layer, distinguishable from the surrounding membrane by its whiteness, and by superficial and waving ridges and sulci. The younger the subject, the greater is its thickness. It is made up of a mass of scales, lying one above the other, and thus presents no resemblance to cartilage, though it has been generally classed as such. In the interior of its structure, where it corresponds to the molar teeth, small vesicles may be frequently observed, varying in size from one-fourth to one-eighth of a line in diameter. On microscopic examination, the particles of these are found to consist of attenuated scales, and their cavity to contain a fluid abounding in minute granules and cells. They are probably the "glands" described by Serres as intended for the secretion of the tartar. Larger vesicles are also found implanted in the vascular mucous membrane, composed of a very delicate tissue, and containing a transparent fluid, which coagulates on the application of heat or acid. In this fluid float numerous globules and scales, similar to those of the epithelium generally. The internal, or attached surface of the alveolar epithelium presents numerous fringed processes, which sink into the substance of the subjacent mucous membrane. These are found to be composed of elongated scales. By immersion in water or diluted spirits of wine, these fringes are much enlarged, and their size, indeed, exceeds that of the dense epithelium itself.

Mr. Hodgson made some remarks on organization without any perceptible vascular connexions, and referred to the ovum at an early period, and the crystalline lens, as examples.—Dr. Macartney brought forward the circumstances under which loose cartilages existed in the knee joint as instances of the same phenomena, which he said increased and de-

† A full description of this structure will be found in a paper by Mr. Nasmyth, in the forthcoming volume of the Transactions of the Medico-Chirurgical Society, accompanied by drawings.

creased, and changed their structure, existing at first as coagulable lymph, and afterwards as cartilage and bone, without any vascular connexions.—Prof. Partridge adduced as instances the loose bodies in the sheaths of tendons, which he knew to enlarge, though they were previously completely detached.

OUR WEEKLY GOSSIP.

The prevailing quiet at home has induced us to hunt over the foreign papers and journals, in the hope that something might be thence gleaned, but all seem subject to the same summer influences. It may be well, however, to remind our scientific friends, that, as announced some time since (*Athen.* No. 599), the Italian savans are to assemble at Pisa in October; that the French Geologists meet in the same month; and that the German Naturalists, this year, hold their session at Pyrmont. An account appears in the *Nördische Blätter*, of an immense land slip at Federowka, a village situated on the Volga. The inhabitants, it is said, were suddenly awakened by a noise resembling that of an earthquake, accompanied by a violent motion in the ground. They rushed out into the street, and perceived, with terror, that the whole valley on which the greater part of their village is built had slipped from its place at the foot of the mountain, and was sliding towards the river. A sort of undulating motion was observed in the ground, which soon split into a succession of terraces, as perfect as if made by art, and, in many places where the hills had been, little lakes were formed, by water rushing in. The motion of the ground continued, with more or less violence, for nearly three days, and seventy houses were either wholly or partially destroyed. Fortunately, no lives were lost, as the peasants lived in the open air during the whole progress of the phenomena. On one side of the village rise high hills, the upper strata of which are of limestone, but the lower of various kinds of clay, whilst on the opposite side it is washed by the Volga, which is here hemmed into a narrow bed; and the waters, thus confined, are supposed to have forced a passage between the stony and alluvial beds.

On the subject of the appointment by the French Government of M. Fresnil as consular agent to Mecca, a writer in *Das Ausland* observes—M. Fresnil's official duties will bring him into a locality convenient for his peculiar branch of Oriental study. The completion of his Grammar on the oldest of all Arabian dialects may now be expected, as well as, in all probability, an explanation of the inscriptions lately discovered in South Arabia. It is his intention, in the first instance, to visit Hijir, in the province of Neschid, fifteen days' journey from Medina, where there are many Himyarite monuments, with inscriptions and sculptures. There are, at present, several French travellers in different parts of the East, whose previously-acquired knowledge is sufficient to give value to their narratives. Theroulde, a pupil of Bornouf, is in India, and, after having passed two years in Calcutta, has continued his voyage up the Ganges. The last accounts from him are from Allahabad, but he will go as far as Lahore and Cashmere. Batta, the son of the Italian historian, is just returned from Arabia and Nubia, where he has collected some valuable contributions to Natural History. As soon as these specimens shall have arrived, he intends setting off again for the East. D'Abbadie, who came some months since from Abyssinia, where his brother still remains in the country of the Galla, is on his return. There is more to be hoped from him, than from Armand Lefevre, who was sent thither by the government, but who has spent his time in Egypt, writing articles on eastern politics for the *Revue des Deux Mondes*. The 'Travels in Abyssinia,' by Combes and Tamissier, have lately appeared, in four volumes (*Athen.* No. 562—3). They are not without interest, although it may be doubted whether the travellers possessed either the previous acquirements or the faculty of observation which were desirable. Like many other travellers, they also committed the fault of endeavouring to cover too much ground. Russell, in his 'Description of Aleppo,' and Lane, in his work upon Cairo, have done more for our knowledge of the East, than a dozen of these hasty visitors; and it would be very desirable, if travellers sent out officially should be required to remain some years in an interesting country.

One great obstacle to the use of M. Daguerre's photogenic process, is the difficulty of preserving the pictures when completed, because they are of so delicate a nature, and so easily injured, that the slightest touch effaces them—even M. Daguerre himself has always found it necessary to protect them with a plate of glass, which is both inconvenient and troublesome; and it has, in consequence, been suggested, that if a varnish could be discovered, which might be easily applied to the surface of the plates after the completion of the pictures, and which, whilst it protected them from injury, should not impair their delicacy, it would considerably add to the value and usefulness of the process:—we are happy, therefore, to hear, that M. Dumas has discovered, that a liquid, composed of one part of *dextrine* and five parts of water, forms a varnish of the desired nature. It is said to be well adapted for the purpose, and further possesses the advantage of being easily removed from the surface of the picture, by immersing the whole in boiling water. Time, however, will be required to ascertain whether this varnish has any action on the peculiar mercurial compound of which the image is formed.

We shall next week conclude our Report of the proceedings of the British Association.

MISCELLANEA

Whales.—A Correspondent observes "In your last *Athenæum* (page 677), Mr. Fox is reported to have said in reference to the letter from the Bishop of Durham, 'this letter clearly shows that the bones discovered in Durham Castle belonged to an animal cast on shore on the coast of Durham at Earington, and the date (1661) proves it to be the *oldest* whale of the kind recorded to have been found on the British coast.' I think this is an error, excepting that the instance I am going to adduce does not state of *what kind* the whale was. In the last volume of the Pell Records, published by Mr. F. Devon, page 126, in the 8th year of King Edward the 2d (a° 1315), being 346 years previous, is the following entry: 'To Thomas Springett, William Kempe and Edmond de Greenwich, mariners, in money received by them of the King's gift, for their labour in taking a *whale lately caught near London bridge*, 20*s*.'"

Great Fire in Russia.—On the estate of Count Sheremetieuv, near Moscow, a tremendous conflagration took place a few weeks ago, in what is probably one of the largest villages in the world. Seven hundred houses, including great cotton and cloth manufactories—filled at the time with immense quantities of goods destined for the fair of Nishny Novgorod—were laid in ashes. We mention the circumstance, however, to direct attention to the strange fact that one of the principal losers by this fire, a manufacturer, who after having lost property to the amount of 40,000*l*., is still considered a rich man, is nevertheless a serf of the count, and it is said he is by no means the only person on the estate similarly situated.

Discovery of a Tesselated Pavement.—In a field adjoining the road leading from Rudston to Kilham, a tesselated pavement, about six inches from the surface, was uncovered—the tesseræ differing in size from 1¼ inch to ½ inch, colours white, red, and blue, —white prevailing; laid in lines and forming diamonds—extending over a surface of about 4 yards by 3 yards, walled round on three sides with large rough stones similar to the chalk stones of the Wolds. A great part of the pavement had been destroyed at a former period by some labourers, who had dug it up in the hope of finding treasure, and the place filled up again promiscuously; it contained red bricks, of a square form, 9½ inches by 8½ inches, 1½ inch thick; pieces of plaster smooth on one side and painted, some red all over, some in lines, and some with dashes of red and green, apparently water colours. Below this, at about 3½ feet from the surface, were a number of tiles, in regular order, slightly curved, and having a flank at each side. They were placed flank to flank one with another, having the hollow side downward. The top surface presented an indented half circle, extending from one end to about one-third of the whole length. The size of each tile is about 15 inches by 11¼, and about ¾ of an inch in thickness. Immediately under these was another layer of the same sort of tiles, laid in the same manner, but transversely with the other. Below these was a small quantity of exceedingly black ashes, and near were some pieces of a rather bony-like substance, porous, and having a great semblance to the incrusted moss from the Dropping Well at Knaresborough. Still lower was a layer of fine rich earth, a few inches in thickness, and then a bed of fine natural red clay, probably the material similar to that of which the bricks and tiles had been formed.—*Hull Advertiser.*

Heat in Liquids.—The experiments of M. Despretz concerning the propagation of heat in liquids has been attended with the most satisfactory results. From these it appears, that a liquid column being heated at the upper part, the heat is propagated according to the same laws as those belonging to solid bodies: that the temperature decreases from the axis to the surface, and from the surface to the wall of the side. The depth to which solar heat penetrates in a given time may be easily calculated by these data, in large lakes, and isolated seas.

Fossils.—M. Lartet announces that among his recently found fossils he has met with a Desman, or Musk Shrew, of the same size as that now living in the Pyrenees. If this opinion should be confirmed it will be the first example of a living species existing also among the mammiferæ of the tertiary formations.

Philosophy.—"What's the reason," said Mr. Squeers, "of rheumatics? what do they mean? what do people have 'em for—eh!" Mrs. Sliderskew didn't know, but suggested that it was possibly because they couldn't help it. "Measles, rheumatics, hooping-cough, fevers, agues, and lumbagers," said Mr. Squeers, "is all philosophy together, that's what it is. The heavenly bodies is philosophy, and the earthly bodies is philosophy. If there's a screw loose in a heavenly body, that's philosophy, and if there's a screw loose in a earthly body, that's philosophy too; or it may be that sometimes there's a little metaphysics in it, but that's not often. Philosophy is the chap for me. If a parent asks a question in the classical, commercial, or mathematical line, says I, gravely, 'Why sir, in the first place are you a philosopher?'—'No, Mr. Squeers,' he says, 'I an't.' —'Then sir,' says I, 'I am sorry for you, for I shan't be able to explain it.' Naturally the parent goes away and wishes he was a philosopher, and equally naturally, thinks I'm one.'"

Rural Felicity, described by Mrs. Nickleby.—"The Dibabses lived in the beautiful little white house one story high, covered all over with ivy and creeping plants, with an exquisite little porch, with twining honeysuckles and all sorts of things, where the earwigs used to fall into one's tea on a summer evening, and always fell upon their backs and kicked dreadfully, and where the frogs used to get into the rush-light shades, when one stopped all night, and sit up and look through the little holes like christians.

No Appetite.—Mr. Nickleby used to say that appetite was the best clock in the world, but you have no appetite. I wish you had, and upon my word I really think you ought to take something that would give you one; I am sure I don't know, but I have heard that two or three dozen native lobsters give an appetite, though that comes to the same thing after all, for I suppose you must have an appetite before you can take 'em. If I said lobsters, I meant oysters, but of course it's all the same.

Canal Travelling.—We learn from the *Stirling Journal* that the following experiments have lately been tried on the Forth and Clyde Canal. Mr. John M'Neil, the civil engineer, has had constructed on the banks of the canal a railway upon blocks, on which a locomotive engine has been put, which was used during several days instead of horses, to draw the canal passage-boats, and succeeded in taking them the whole distance of the line at the rate of eight miles an hour. The company, having ascertained the full success of the experiment, will construct a tramway along the canal bank, and will be able to take their passage-boats in future at the rate of eighteen miles an hour.

To Correspondents.—A Country Reader—R.—C. C. —S. M. S.—Antonio Zimines—J. T.—E. J. F.—received.

Just published.

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